Bt Cotton in Andhra Pradesh

A three-year assessment

The first ever sustained independent scientific study of Bt cotton in India

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The study and the film

Three years ago, almost to the day, when the Deccan Development Society[DDS] and the AP Coalition in Defence of Diversity[APCDD] began their research on Bt Cotton in Andhra Pradesh with a particular focus on the cotton district of Warangal, we had no idea what we were walking into. There was a bulldozing hype surrounding Bt Cotton that had bedazzled the politicians and policy makers. A huge scientific lobby was painting Bt cotton as a panacea for farmers and the environment. Corporate money and muscle wielded a power of such magnitude that even the media had been muzzled to a considerable extent. Huge money had poured into creating a dazzling aura around Bt cotton through a blitz of advertisements. It was an unspoken axiom that there was no science other than biotechnology and anything that challenged it was anti-science. The civil society in Andhra Pradesh, by and large, had very little clue about what genetic engineering was all about.

In this atmosphere, anyone who tried to find out the honest truth was labeled as a backward person and an avoidable hurdle in the path of modernity. The APCDD and the DDS braved this hostile environment and embarked on a quest for truth. Two courageous scientists Dr Abdul Qayum, and Mr Kiran Sakkhari, took up cudgels on our behalf, and went about the job of unravelling the agro-socio-economic mystery of Bt cotton.

They selected a transparent and open methodology, stayed close to the farmers, and gathered information from them on a fortnightly basis. Their data collectors were village based grassroots researchers with a deep understanding of agriculture. No other research group on Bt cotton in this country had done season-long studies, and a job as thorough as this. Most groups came once a while after hearing of the cotton disaster, collected data at that point of time and went back. No one stayed continuously with farmers and farming communities to record their changing perceptions about Bt cotton. This makes the present study a unique one

At the end of the first season, when we reported to the world the total disaster of Bt cotton in Andhra Pradesh, one of the most famous apologists for Genetic Engineering, Dr Kameswara Rao, went philosophical in his article *One Swallow Does Not Make A Summer.* The learned doctor pontificated to the lesser mortals: *It is only fair to wait till the end of the three-year period to declare Bt cotton as a success or failure. In the meanwhile, it is certainly reasonable to assess the prospects, in a non-judgmental way, using the commercial results and certainly not field trial data, which have served their purpose in gaining the approval of the GEAC. If we wait till the end of the three-year period, the farmers themselves will come out with their assessment of the benefits of Bt cotton. If the farmer is not convinced, no amount of effort through articles in Science and Nature or the whole world body of crop biotechnologists and governments can make the farmer adopt this technology.*

We have waited till the end of the three years. Now the truth is out. And with it the jury too.. The jury is not composed of outsiders, but the farmers themselves as the venerable Doctor had prescribed. And what is the story that the farmers in AP are telling us with regard to Mahyco-Monsanto Bt hybrids? It is a story of terrible loss, deep pain, and cold anger, leading to explosive violence and even death.

The study ***Bt Coton in Andhra Pradesh: a three year assessment*** is a dispassionate report that captures farmers' engagement with Bt cotton, their resultant economics and the ultimate desperation. On the other hand, an associated film ***Bt Cotton in AP; a three year fraud,*** brilliantly captures the mood and feelings of the farmers as they are led up the garden path by the false promises of a ruthless industry. Both these are historic documents in analysing the impact of Bt cotton in India.

The Monsanto Corporation makes a claim that ***Bt Cotton returns socio economic benefits to smallholder farmers globally.*** [See Monsanto Website] ,To evaluate this claim,, the study justifiably wanted to see how small farmers, especially under the rainfed conditions benefited from this scientific miracle. . It therefore kept its focus on this section of farmers.

And now, what does the study reveal?

- ***Mahyco-Monsanto Bt cotton, Bollgard, has failed miserably for small farmers in Andhra Pradesh, India, in terms of yields.***
  While the three year average yield from Bollgard cotton for small farmers, has remained at around 650 kgs per acre, the yield for small farmers under rainfed conditions in 2005 from Bt is just about 535 kgs. The same farmers got 150 kgs more yield from growing non Bt hybrids under the same conditions as Bt. Therefore non-Bt has surpassed Bt in terms of yield by nearly 30% with 10% less expense. Therefore Bt has failed the farmers twice over in terms of yield.

- ***Bollgard Cotton did not reduce pesticide use.***
  Actually the volume of pesticide use by Bt farmers and Non Bt farmers was so thin that it was untraceable. Bt farmers on an average bought and used Rs. 2571 worth of pesticide while the non Bt farmers bought and used Rs.2766 worth of pesticides over three years. The difference is barely around 7% of the pest management costs and an invisible 2% of their total cultivation costs.

- ***Bollgard did not bring profit to farmers***
  The three year average tells us that the non-Bt farmers earned 60% more than Bt farmers. In actual fact, in place of profit, Bt cotton, especially the Mahyco Monsanto varieties, brought untold miseries to farmers culminating in violent street protests and the burning of seed outlets in the city of Warangal. Farmers tied up Mahyco Monsanto representatives in their villages and the police had to go and rescue the hapless salesmen.

- ***Bollgard did not reduce the cost of cultivation***
  Looking back, it is evident that farmers had to spend not only 3-4 times more for the Mahyco-Monsanto's proprietary Bollgard seeds but had to take extra care to manure, irrigate and *look after* their precious Bt crop. Many farmers, especially in the rainfed areas, spent at least a couple of thousand rupees more per acre in comparison to their non Bt hybrids. On an average, the Bt farmers had incurred 12% more costs in cultivating their Bt crops in comparison with their non Bt fraternity.

- ***Bollgard did not generate healthier environment.***
  Our researchers felt that a special kind of root rot was being spread by Bollgard cotton. Farmers came out with complaints that they were not able to grow other crops after Bt because it had infected their soil very badly. As against this,the soil in which the farmers grew non-Bt hybrids was extremely friendly to other crops. This is an early warning and needs active research by soil scientists immediately.

On all counts, the Mahyco-Monsanto Bt hybrids had failed the farming community in Andhra Pradesh.

But with an unimaginable audacity, the industry *commissioned* a study to a *market research* agency [recall that in 2004 also the company had commissioned the study to another market research agency and not to scientists or development economists] and with its now well known data manipulation tactics, claimed that the AP farmers had gained five fold from Bollgard, compared to their non Bt hybrids. Hundreds of farmers, who have testified in the study as well as in the film, have repeatedly told us how the Bollgard cultivation had ruined them totally. In the face of this reality, the claim by Mahyco Monsanto is an example of dark humour and can easily earn them the Lie of the Century award.

Farmers in Warangal were so vexed with this corporate distortion of their misery that they held hostage the Mahyco Monsanto representative in their village, took to the streets in a violent protest in the city of Warangal, and burnt and destroyed seed stores that stocked Bollgard. Newspapers in the district continuously reported the total ruin of tens of thousands of acres that had planted Bollgard cotton.

But the company-sponsored reports did not reflect any of this reality. They continued to play the company tunes and blow up their miniscule, manipulated successes. Bureaucrats were bought over, official enquiries were distorted, false data was fed to media and an unreal world under the corporate command was created.

It is this atmosphere of total surrender to the industry that makes attempts like the current study very important. They not only uphold the dignity of independent scientific enquiry but also herald the liberation of the scientific community from the chains of corporate sponsored tainted- research. They also reflect the true reality of the concerns of the farming communities and prevent these concerns from being bulldozed by the corporate power, which in league with arrogant pseudo science, populate the lobbies of corrupt political power.

I once again thank the two courageous researchers Dr Abdul Qayum and Mr Kiran Sakkhari, who put their hearts and souls in finding out the truth about Bt cotton from the fields and farms of small and hapless farmers in various parts of Andhra Pradesh.

By now they have made their mark worldwide as exceptional researchers who have the mettle in their soul to swim against fashionable currents. My deepest gratitude goes to them. Ms Venkata Lakshmi of the Permaculture Association of India, who co-researched the study grew in stature as a researcher over the last two years. Her patient interaction with farmers unearthed priceless perceptions. I thank her and wish her a great future in this line of research.

The civil society groups in these three districts especially, CROPS, JAGRUTI, MARI, PEACE, PRAGATI, PRATIBHA, SARVODAYA, SEED, SEVA, SPACE, SSS, SUN(P) and CSTD have been the backbone of the study. I express my earnest appreciation for their collaboration in the study. My very special thanks are due to Mr Murali of MARI, Warangal and Mr Damodar, the Warangal District Convenor of APCDD, who offered unstinted support and guidance to the study at every stage. The team of data writers [mentioned at the end of this study] from all the collaborating NGOs, who stayed in their villages meeting farmers at regular intervals to collect and collate their data, deserve a huge, huge thanks.

My colleague Giridhar, Joint Director, DDS patiently provided the logistic support all through the years and made the study possible.

The women filmmakers of DDS Community Media Trust have once again made an extraordinary film called ***Bt Cotton in Warangal : A three year fraud.*** Their previous film ***Why are Warangal Farmers Angry with Bt Cotton*** made in 2003has now been translated into French, Spanish, Thai and German besides

English and is making waves around the world. It has also been shown in film festivals, national and internationl. They have continued their strides to bring out a new perspective on Bt cotton this year. To make this film, they have travelled to Warangal month after month, braving the scorching sun, carrying their equipment, walking miles into farmers' fields, talking to farmers, especially women, creating a camaraderie and generating brilliant interviews. They have filmed the death of Bt cotton at every stage and analysed the reasons with farmers. The last year of their filming was led by Eedulapally Manjula and was supported by Matoor Shakuntala, Nagwar Kavita, Ippapalle Mollamma, Humnapur Laxmamma, Borancha Sangamma and Pastapur Chinna Narsamma. Being small and marginal farmers themselves, the media women of CMT have sensitively captured the images and voices of the Bt farmers in crisis. The brilliance and invaluableness of their effort cannot be adequately described. I reserve my deepest appreciation for them.

And finally my heart and gratitude go out to those hundreds of farmers who spent their precious time with us in offering us information and their perceptions on the performance of Bt cotton on their fields. Most of them were small farmers who had seen Bt cotton as the light at the end of the tunnel of darkness they had traversed in pesticide dominated cotton cultivation. But it was not to be. The light that shone was an artificial glow produced by the industry's hype. When they came out of the tunnel and saw denser darkness surrounding them, they lost all hope in life. It is this sense of total loss that they have shared with us. We hope somewhere this report will have some impact in doing justice for these farmers and liberate them from the clutches of the predatory industrial agriculture.

HIVOS and *Find Your Feet*, two organisations who have supported this initiative deserve our grateful thanks. Permaculture Association of India has made invaluable contribution to the study and warrants a special thanks.

Our sincere gratitude goes to Ms Supriya Bhalerao of Booksline, who now become a miracle woman, being able to take the copy almost till the last nanosecond. Her patience and contribution to the design of this book are invaluable.

P V Satheesh
Convenor, AP Coalition in Defence of Diversity
Director, Deccan Development Society

April 12, 2005

1. Introduction

Cotton, popularly known as 'white gold', is an important commercial crop not only in India but also in many other countries. India ranks second among the cotton-growing countries, with around 8.9 mha of land under cotton cultivation. Cotton farming is a big market for hybrid seed companies, pesticide companies and non-formal credit suppliers, often bundled together and labeled as 'input dealers'. In India, the input dealers play a major role in the promotion of the products/agri-inputs.

The acreage under cotton raised by a family in a village has become a status symbol among the local farming community. Nevertheless it is also a fact that the challenges like monetary investments, weather aberrations, consequent endemic pests and diseases and market fluctuations have hit the producers so severely that most of them end up deep in debt. Epidemics of whitefly and bollworms, besides frequent and severe droughts, had forced several farmers to commit suicide. Individual cases of suicide by cotton farmers are still frequently in the news.

In the face of progressively acquired resistance of the bollworms, especially *Helicoverpa* spp., and of the recent seeming invincibility of pink boll worms (*Pectinophora gossyipiella*), pests seemed to have won the war against the most toxic and recently released insecticides, thereby inflicting heavy losses on the cotton growers. In addition, regular substantial damage by a variety of sucking pests had driven the farmers to intermittent chemical sprayings.

Bt Cotton

The desperate situation faced by many cotton farmers (suicides among cotton farmers have become a commonplace occurrence) has led to a search for solutions. Research in biotechnology has led to the development of genetically modified crops like Bt cotton, with a gene from *Bacillus thuringiensis* transferred to selected host cotton hybrids. A few Bt hybrids have been released in India as well. The seed companies claim that the Bt hybrids have inbuilt resistance to the bollworms. It is also reported that the toxin produced in the transgenic hybrid plant is effective against all the 3 species of the bollworms, viz., spotted bollworms, American bollworm (*Helicoverpa* spp.), and pink bollworm (*Pectinophora gossypiella)*.

The Ministry of Environment and Forests, Government of India, constituted a 'Genetic Engineering Approval Committee', which accorded approval in March 2002 to commercial cultivation of three Bt.cotton hybrids, viz., MECH-162, MECH-12 and MECH-184, for a period of 3 years from April 2002 to March 2005. Monsanto (Mahyco-Monsanto Biotech Ltd) developed these cotton hybrids by inserting genes responsible for production of delta-endotoxin from a soil bacterium, *Bacillus thuringiensis*. This had earlier been released for commercial cultivation in 1996 as '*Bollgard*' in the US and '*Ingard*' in Australia.

Perhaps no other crop has garnered as much controversy in the history of Indian agriculture as has Bt cotton, both before as well as after its introduction.

Not only in India but all over the world, these genetically altered crops (GACs) are subjects of controversy.

There are trillions of dollars involved in the promotion of genetically altered crops, and the seed companies have launched an aggressive marketing blitz to promote these crops. On the one hand, we have a situation where cotton farmers are indeed in a dire situation, and there is a crying need for a solution. On the other hand, there are a variety of dangers. First, as mentioned earlier, there are fears about genetic engineering and the possible creation of life forms that prove harmful to human beings and the environment. The implications in terms of loss of biodiversity are also frightening. Second, there is a genuine danger that cultivation of such crops would reduce farmers at large to 'eternal-dependents' on the companies for their critical inputs.

The marketing blitz of the seed companies has convinced many farmers to switch over to Bt cotton. This blitz has been accompanied by research from the companies, claiming to 'prove' the advantages of Bt cotton over other varieties. What farmers most require at this point of time is a dispassionate analysis of the benefits and costs of cultivating Bt cotton. Hence this study.

Was Bollgard cotton a boon to the small farmer?

An overwhelming number of small farmers reported severe losses by farming Bt cotton. Small farmers under rainfed conditions in 2004 - 05 **earned five times more from Non-Bt cotton than Bollgard**

2. Cotton trends in Andhra Pradesh

Cotton Area, Production and Productivity in Andhra Pradesh

Cotton, despite its shockingly unpredictable performance as a crop and the consequent farmers' suicides, is scaling up area and production according to the official statistics presented in Table 1.

All categories of farmers throughout Andhra Pradesh have come to look upon cotton as a panacea for their economic and social problems. The area under this crop has increased from 10.45 lakh ha. in 1999-2001 to 11.41 lakh ha. in 2004-2005.

Some of the specific features of cotton cultivation in Andhra Pradesh are as follows:

(i) The area under irrigated cotton has been increasing from year to year and by 2001-02 it reached 2.37 lakh ha. from 1.70 lakh ha. in 1997-98, a phenomenal increase of 67000 ha (nearly 40%) However this increase in area is only under irrigated situations.

(ii) Around 100 hybrids of cotton are being cultivated in the study area.

(iii) Except for a small area measuring a few acres in Adilabad where local varieties and few non-hybrids continue to be grown, in all other areas covered by the study, only hybrid cottons are being cultivated.

(iv) The claim of anticipated higher income has been so intensely propagated that many small and marginal farmers have been tempted to raise cotton on all types of soils.

Table 1: Cotton acerage in the selected districts for the study

S. No.	Year	Area in Lakh. of Ha.			Total production in lakhs of bales of 170 kg each		
		A.P.	India	A.P. as percentage of All-India	A.P.	India	A.P. as percentage of All-India
1	Acreage for the period of 5 years ending with 2001	10.54	89.14	11.82	15.92	116.84	13.6
2	2001-2002	11.08	91.3	12.9	16.60	100	16.6
3	2002-2003	8.03	76.7	10.47	10.86	87.2	12.5
4	2003-2004	8.37	76.4	10.95	18.89	137.9	13.7
5	2004-2005 (estimated)	11.41	N.A	N.A	27.3	N.A	N.A

(Source: Dept of Agriculture, GoAP)

3. Background

Warangal District in Andhra Pradesh attracted the attention of the world a few years ago, when more than 200 cotton farmers, caught in the vicious cycle of pests, pesticides and debt, found no way out and committed suicide. Therefore, the district naturally became an area of interest for governmental and non-government organisations. For an agro-industry like Mahyco-Monsanto Biotech Ltd., this was a godsent opportunity to promote their GE technology. In *Kharif 2002* they released two Bt cotton hybrids, viz., MECH-12 Bt, and MECH-162 Bt, in Warangal district and to a lesser extent in adjoining districts.

It is in this context that the Andhra Pradesh Coalition in Defence of Diversity (APCIDD) and the Deccan Development Society decided to initiate a systematic study in order to understand the facts in the field clearly and make them available for a transparent public debate. (The Andhra Pradesh Coalition in Defence of Diversity is a coalition of over 140 civil society groups in the state of Andhra Pradesh.) Two agricultural scientists, Dr Abdul Qayum, formerly Joint Director of Agriculture, Andhra Pradesh, and Kiran Sakkhari, who had worked with ICRISAT for three years, led the scientific study. The study was made possible through the strong support provided by APCIDD's Warangal chapter and MARI (Modern Architects for Rural India), a leading NGO in Warangal.

The three season-long studies conducted from *kharif* 2002- to *kharif* 2004 involved all the stakeholders in the district—farmers who cultivated Bt and non-Bt hybrids, scientists associated with cotton, officials of the State agricultural department and the agricultural market committee, and the manager of a ginning factory.

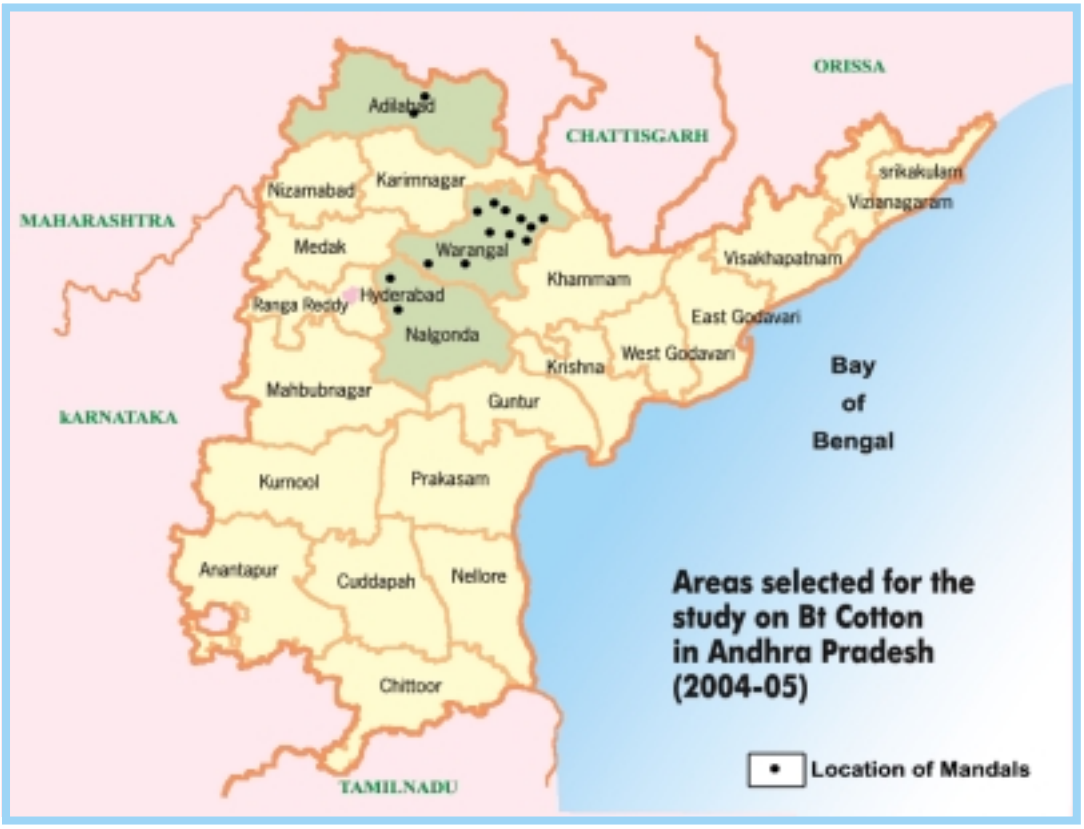
The research in 2002-2003 was confined only to Warangal District. But it was enlarged during the *Kharif* 2003 season to include three cotton-growing districts in Andhra Pradesh, viz., Warangal, Adilabad and Kurnool, covering 27 villages with a sample size of 164 farmers. The season-long study systematically

S. no.	District	2001 - 02			
		Geographical area (Lakh ha)	Cultivated area (Lakh ha)	Cotton area area (Lakh ha)	District % state area under cotton (as per 2001-02 area)
1	Warangal	12.8	4.9 l	1.8	16.2
2	Adilabad	16.2	5.27	1.75	15.8
3	Nalgonda	14.2	4.9	1.13	10.2

collected field data from farmers using structured interview schedules which recorded each and every farmer's income and expenditure patterns with regard to cultivation of cotton, both Bt and non-Bt. This was done at fortnightly intervals right from sowing of the cotton crop till it was harvested. The data collection was helped by 11 NGOs working in these districts.

Encouraged by the response to the studies done in the first two years, the research was continued in the third year (2004) as well, with the same broad objectives and methodology as followed in the earlier years, though certain changes did take place, based on the experience of APCIDD and DDS and certain other factors (e.g., along with Monsanto Bt cotton already in the field, Rasi Bt cotton hybrids were also released in Andhra Pradesh in 2004-05. Most importantly, over the years the research focused more and more on the situation of small farmers especially under rainfed situations. The study also decided, in spite of the introduction of the Bt hybrids introduced by other companies like RASI in AP, to concentrate only on analysing the performance of the Mahyco-Monsanto Bt cotton vis-à-vis the promises made by the company.

This report is a consolidated and condensed account of the research done over these three years, and provides an objective analysis of the performance of the Bt cotton in the study areas. For details on each year's studies, see the separate reports.



4. Objectives & Methodology

Objectives of the study

(i) To ascertain whether genetically engineered Bt cotton fulfilled the following promises of the seed producing companies and expectations of stakeholders: **(a)** Bt cotton successfully resists the infestation of the boll worms and thereby increase yields substantially, **(b)** Bt hybrids can reduce the need for application of pesticides and helps in reducing the overall cost of cotton cultivation and increasing the profit.
(ii) to find out how the MECH Bt hybrids were performing *vis à vis* Non Bt hybrids under stress situations especially under rainfed conditions
(iii) To study the emerging problems and constraints (if any) in cultivating Bt cotton hybrids at various stages
(iv) To identify the future issues and problems in the context of socio-economic background of the farmers and their experiences.
(v) To keep a sharp focus on the experiences of small farmers under rainfed conditions.

Methodology

The methodology over the three years of the study was broadly the same, but there were some variations, particularly in the study areas and the farmers selected for the study. The variations were due to modifications made on the basis of experience, and to focus the study more specifically on the experiences of small farmers. For this reason, the salient features of the methodology for each of the three years of the study are given separately below.

Year 2002-03

1. In the year 2002-03, a season-long research was initiated in two villages of Warangal district, where 22 farmers had planted Bt. Two farmers were selected randomly from each village, and throughout the season these farmers were interviewed every month. Simultaneously, their experiences about the performance of the crop were captured on video by the Community Media Trust of Pastapur village. The video documentation started in the month of August 2002 and continued till the end of the crop season, i.e., till April 2003.

Community researchers in action
Farmer - filmmakers of the DDS Community Media Trust filming interviews with the farmers

2. A mid-season exploratory study involving 21 farmers spread across 11 villages in the district was conducted (in November 2002) to assess the performance of the crop across the district. The villages represented a variety of ecosystems in the district. The study team visited the fields and interviewed the farmers individually and in groups. While these 21 farmers remained primary respondents, focus group discussions were also held in their villages on their experiences with Bt cotton cultivation. In each of these focus groups there were approximately 15-20 farmers. Thus the total number of farmers who were consulted on the issue of Bt through the exploratory study during mid-season was more than 200.

3. The mid season study team had discussions with different stakeholders in the district involving farmers, scientists of Regional Agricultural Research Station, the market committee secretary, and the manager of a ginning mill, on the performance of the crop till mid-November 2002. In April 2003, at the end of the cropping season, an extensive survey was conducted by randomly selecting 225 farmers out of around 1200 farmers who had taken up the cultivation of Bt cotton in Warangal district. They constituted about 20 per cent of all Bt farmers in the district.

Of the 225 farmers surveyed, 86 farmers (38.2 per cent), had land holdings up to 5 acres, 84 (37.4 per cent) had 5-10 acres, and the remaining 55 (24.4 per cent) had more than 10 acres of land.

Year 2003-04

In 2003-04, the study included two new districts (Adilabad and Kurnool) where Bt cotton was introduced, as also the district in the first year's study, Warangal. As in the first year, the study was structured in 3 tiers:

a. A season-long video documentation of crop stand and farmers observations at regular monthly intervals in three selected villages.
b. Fortnightly recording of data on field operations, use of fertilisers and pesticides, status of crop and pest damage, in 164 farmers' fields from 28 villages in the three districts during the whole crop season (from July 2003 to March 2004). Farmers' reactions were also recorded, using a questionnaire. Of the farmers surveyed, 65 (39.6 per cent) were small farmers, owning less than 2 ha of land, 68 (41.4 per cent) were medium farmers, with land holdings of between 2 and 4 ha, and the remaining 31 farmers (9.0 per cent) were large farmers, with land holdings of more than 4 ha.

Grossroots researchers were the backbone of the study
Regular fortnightly sessions were held with the community level researchers / data collectors

c) The study team of scientists regularly visited the fields of the above selected farmers alongside the fields of other farmers duly verifying the data collected by investigators (vide para a& b above) and or noting some specific observations relating to Bt and Non-Bt cotton hybrids.

The report for the year relaeased on 30th April 2004 has a gist of observations.

Year 2004-05

The methodology in this year was based on the same principles as in 2003-04, with a few refinements. The study covered the districts of Warangal, Adilabad and Nalgonda (instead of Kurnool). New areas were included from Adilabad and Nalgonda districts,. **a new hybrid, RCH Bt 2, of Rasi Co. has also been included in the programme of study for the simple reason that it has been commercially released for cultivation during the year.** The selection of the districts was done in consultation with the members of APCIDD. The focus of the study has nevertheless remained on the Mahyco-Monsanto Bt hybrids, since they were the Bt cotton seeds under study for the first two seasons and occupied more than 55% of the total Bt sales in Andhra Pradesh. The villages where Bt cotton seed had been distributed during this season were selected for study at random. 220 farmers from 28 villages were covered in the study. Efforts were made to select farmers who had sown both Bt.hybrids and other conventional hybrids. This ensured that the study captured economics from both Bt and Non-Bt hybrids for the same farmers as well as preferential operations done for Bt crop, if any by the farmer.

The same three-tier approach as in 2003-04 was taken, with fortnightly recording of data, monthly visits by teams of scientists, and a season-long video recording of farmers' reactions.

Using the same categorization of farmers as in the previous year, 121 (55 per cent) small farmers, 81 (36.8 per cent) medium farmers, and 18 (8.2 per cent) large farmers were selected for the study. The number of large farmers (as per this classification) was very small and were poorly represented in the sample, hence their results have not been presented separately. The farmers were from areas with rainfall varying between 650 mm and 1000 mm per annum. Both red and black soil areas were included in the sample selected. Similarly irrigated and rainfed cotton areas were also represented in the sample.

The farmers in the sample fall into the following categories:

Table 2 Sampled farmers under irrigation & rainfed conditions

S no	Class / Category of farmer	No. of farmers	
		Growing Bt	Growing Non-Bt
1	Irrigated cotton	154	133
2	Rainfed cotton	66	87
	Total	**220**	**220**
	Farmers growing MECH Bt hybids	106	
	Farmers growing RCH-2 Bt	114	
	Total	**220**	

5. Seasons and crop coverage

Year 2002-03

Kharif 2002 was a season of extremely erratic rainfall marked by long dry spells and high day temperatures. As against the normal practice of sowing in the second week of June, the sowings were delayed and staggered and were taken up from mid-June to late July, in some places extending even up to the first week of August. Farmers were worried over inadequate rains and consequent had delayed sowing. Due to the severe pest outbreak witnessed during the preceding cotton season (*Kharif* 2001), many of the cotton farmers individually reduced their area of cultivation in the *Kharif* season 2002 by about 25 per cent. This was confirmed by the Joint Director of Agriculture, Warangal, who said that coverage under cotton during *Kharif* 2002 was only 1.07 lakh ha as against the normal area of 1.30 lakh ha and the highest being about 1.72 lakh ha reported in *Kharif* 2001.

Year 2003-04

The year 2003-2004 was a fairly good year in respect of total rainfall when compared with the year 2002-2003, when the rainfall deficit was 37 per cent, 25.3 per cent and 25.7 per cent respectively in the three districts of Warangal, Adilabad and Kurnool. The timely monsoon rains in 2003-2004 favoured comparatively larger coverage under cotton.

An area of 11.41 lakh ha. is reported to have been brought under cotton during the year 2004-05 in A.P. as against 8.37 lakh ha sown during the preceding year. There were two major dry spells, first during early post-seeding period and the second during August-September. The overall deficit rainfall varied from 30 per cent to 45 per cent in the three selected districts of Warangal, Adilabad and Nalgonda. This deficit rainfall and long dry spells had adverse effect on the growth and yield of the crop.

6. Results

The basic objective of this study has been to assess the performance of Mahyco-Mosanto Bt cotton vis-à-vis the claims made on its behalf such as the reduced application of pesticides and promise of higher prices in the market. The results from the three year study have provided conclusive data to say that almost every one of these claims have been very economical with truth. Let us begin with a comparative performance of Mahyco-Monsanto Bt hybrids vis a vis non Bt hybrids popular among farmers in the region.

A cursory look at the above two tables (3 &4) confirms the dismal performance of the Mahyco-Monsanto bt hybrids *vis-à-vis* Non Bt hybrids.

Table 3: Year-wise performance of Mahyco-Monsanto Bt hybrids[MECH Bt] and Non-Bt hybrids since 2002-03 to 2004-05

	2002-03			2003-04			2004-05		
	Economics of cultivation of Bt and Non Bt crops and the % of expenditure to the total cost of cultivation								
Description (Costs / acre)	**MECH Bt**	**Non Bt**	**Gain with BT**	**MECH Bt**	**Non Bt**	**Gain with BT**	**MECH Bt**	**Non Bt**	**Gain with BT**
Seed cost (Rs/acre)	1600 (15%)	450 (5%)	**-1150**	1469 (12%)	445 (4%)	**-1024**	1602 (13%)	505 (5%)	**-1097**
Pest management cost (Rs/acre)	2909 (27%)	2971 (31%)	**62**	2287 (19%)	2608 (23%)	**321**	2510 (21%)	2717 (26%)	**207**
total costs of cultivation (Rs/acre)	10655	9653	**-1002**	12030	11127	**-903**	12081	10298	**-1783**
Net returns (Rs/acre)	-1295	5368	**-6663**	7650	8401	**-751**	-252	597	**-849**
Yield (kg/acre)	450	690	**-240**	827	800	**27**	669	635	**34**

Figures in parenthesis denote percentage to the total cost of cultivation

Table 4: Three-year averages of Mahyco-Monsanto hybrids and Non-Bt hybrids

Description (Costs / acre)	A three year average		
	MECH Bt	Non Bt	Gain with Bt
Seed cost (Rs/acre)	1557 (13.4%)	466 (4.5%)	**-1090 [- 234%]**
Pest management cost (Rs/acre)	2571 (22%)	2766 (27%)	**195 [+ 7%]**
total costs of cultivation (Rs/acre)	11594	10336	**-1259 [- 12%]**
Net returns (Rs/acre)	2032	4787	**-2755 [- 57%]**
Yield (kg/acre)	649	708	**-59 [- 8.3]**

The year of the introduction of Mahyco-Monsanto Bt hybrids (2002-03), was a year of disaster, with poor rains and prolonged drought spells subjecting all crops to moisture stress situation. Compared to the Non-Bt hybrids, Mahyco-Monsanto hybrids performed very poorly under similar situations. Farmers who opted for Monasnto hybrids incurred huge losses upto 600%. Even the pesticide consumption was not significantly reduced with Mahyco-Monsanto hybrids. The difference was only 7% between non Bt and Bt farmers. In terms of costs of cultivation, this accounted only for a measly 2% of the overall costs.

In the second year, i.e., in 2003-04, the weather cooperated with farmers offering timely and adequate rainfall. Unusually the price of the cotton also was very good making the cotton farmers a happy lot. Even under these completely favourable situations, the pesticide consumption on Mahyco-Monsanto cotton was not reduced significantly. In terms of net returns non-Bt farmers earned 9% more than the from Mahyco-Monsanto Bt farmers.

The third year of cultivation i.e., in 2004-05, witnessed a 36% increase in the cotton area cultivation. Though the weather was favourale in the early season, the crop suffered a prolonged dry spell in between August and October, affecting the performance of the crop in terms of yield. Besides the weather aberrations, lower market price for seed cotton drastically reduced the net returns from the cotton crop. The Mahyco-Monsanto Bt hybrids recorded a net loss, while non-Bt hybrids saved farmers in terms of net gains.

Another common trend observed during the three year period of the study was with the cost of cultivation. Mahyco-Monsanto Bt hybrids *continuously incurred* higher costs of cultivation. Having spent almost 3 times more on the seed, farmers were giving more attention for the Bt crop, giving it preferential irrigations, more fertilizers and timely operations. Even after taking so much of care, Bollgard failed farmers over all the three years.

We present below the detailed year wise performance of the Monsato hybrids in comparison with the Non-Bt hybrids.

6.1 Year 2002-03

From the table 5, one can very easily infer that of the total number of Bt farmers who were sampled, 48% suffered losses up to Rs 5000 per acre, while 22.6 % suffered losses above Rs 5000 per acre. On the other hand, only 16 % of the non-Bt farmers suffered losses up to Rs 5000 and only a meagre percentage (1.4%) suffered losses more than Rs 5000. Further, while a sizeable 31 % of the non-Bt farmers gained a net profit of more than Rs 10,000 per acre, only 5.8% of Bt farmers could manage to gain more than Rs 10,000 per acre.

6.1.1 Salient observations

Table 5 shows that, on an average, the cost of cultivation of Bt crop was Rs 10,655 per acre,

Table 5 : Economics of cultivation of Bt and Non-Bt cotton in 2002-03

No.	Characteristic	Comparative results	
		Bt	Popular hybrids (Non Bt)
	Total cost of cultivation/acre	**Rs 10,655**	**Rs 9563**
1	**Cost of seed per acre**	**Rs 1600**	**Rs 450-500**
2	Expenditure on plant protection per acre	Rs 2909	Rs 2971
3	Percentage of expenditure on plant protection to total cost of cultivation	27%	31%
4	**Average yields per acre**	**4.5 q**	**6.9 q**
5	**Market price per quintal of seed cotton**	**Rs 2080**	**Rs 2164**
6	**Net returns per acre at the end of cropping season**	**(–) Rs 1295**	**Rs 5368**
7	Number of farmers who incurred losses	160 (71%)	40 (18%)
	✠ Rs > 10,000	3 (1.3%)	1 (0.4%)
	✠ Rs 7501-10,000	15 (6.7%)	2 (1%)
	✠ Rs 5001-7500	33 (14.6%)	0 (-)
	✠ Rs < 5000	109 (48.4%)	37 (16.6%)
8	Number of farmers who made profits	65 (29%)	185 (82 %)
	✠ Upto Rs 5000	39 (17.4%)	67 (29.7%)
	✠ Rs 5001-7500	4 (1.8%)	28 (12.4%)
	✠ Rs 7501-10,000	9 (4%)	20 (8.9%)
	✠ Rs >10,000	13 (5.8%)	70 (31%)

whereas for non-Bt it was Rs 9563. It clearly reveals that cultivation of Bt costed Rs. 1092 more than that of non-Bt cotton.

Farmers who cultivated Bt cotton spent **a staggering**15 per cent of the total cost of cultivation on the seed as against 5 per cent in case of non-Bt farmers], with the hope that it would reduce their spending on the pesticide sprays and improve their yields substantially. Bt farmers had to pay Rs 1600 per acre towards the seed cost, whereas non-Bt farmers spent Rs 450-500 per acre, which means the farmer had spent almost Rs. 1100 more just on the seed cost, which is out of reach of small or lower middle class of farmers who had to resort to loans.

On an average, the expenditure on plant protection per acre was Rs 2909 on Bt while it was Rs 2971 for non-Bt. This shows only a marginal decrease (Rs 62 per acre) in the use of pesticides on Bt crop. On an average, a Bt farmer had to spend 27 % of the total cost of cultivation on plant protection, whereas a non-Bt farmer spent a slightly higher amount on plant protection, i.e., 31% of the total cost of cultivation of the crop, which in itself is substantially lesser by Rs. 700/- than Bt.

The question is whether the increased costs of Bt cultivation are compensated by the benefits of Bt cotton. In terms of final yields, the duration of Bt crop in the field was less compared to non-Bt hybrids. Bt

cotton was completely harvested by January (seven months after its sowing), while non-Bt stayed on the field until March, giving it a two-month advantage. The number of pickings was therefore reduced in Bt cotton, affecting its total yields. On an average, a non-Bt farmer reaped a harvest of 6.9 quintals [690 kgs] per acre, whereas a Bt farmer had to be satisfied with just 4.5 quintal [450 kgs] per acre, suffering a net 35 per cent decrease in the yield per acre.

To sum up, in spite of spending more on seed, a Bt farmer had only a marginal reduction (4 per cent) in pesticide costs, only to end up with a crippling 35 per cent loss in the final yields.

6.1.2 Market price for seed cotton

In addition, Bt cotton fetched Rs 2080 per quintal (even after mixing both Bt and non-Bt seed cottons to offset the risk of lower price for the Bt seed cotton), whereas pure non-Bt seed cotton fetched an amount of Rs 2164 per q. The farmers said that there was a reduction of Rs 200 to Rs 300 per quintal of Bt seed cotton compared to non-Bt seed cotton in the market.

To a question during the study regarding whether there was any improvement in the yields with the cultivation of Bt, 64.5 % of the farmers categorically said that there was no yield improvement, while 2.2 % said that the yield was same as that of other hybrids. Only 7.5 per cent of farmers said there was an improvement in the yield. *Interestingly, 25.8 % of the farmers asserted that the yields had gone down with the cultivation of Bt crop*. This may be due to early maturity of the crop compared to non-Bt hybrids. In most cases, Bt had completed yielding by late December or early January whereas non-Bt hybrids continued to yield until March. Therefore, non-Bt hybrids had a two month longer yielding period compared to Bt.

When the net returns were taken into consideration, a non-Bt farmer obtained Rs 6663 more than the Bt farmer per acre, a five times higher net earning. The study further revealed that 71 per cent of the Bt farmers experienced losses due to Bt. cultivation, whereas only 18 per cent of non-Bt farmers incurred losses.

6.1.3 Use of pesticides on Bt and non-Bt crops

With regard to the use of pesticides on Bt cotton, 66 per cent of the farmers opined that there was no reduction in the overall pesticide use on the Bt crop as compared to non-Bt.

Data from 50 farmers was analysed on the usage of pesticides on Bt and non-Bt crops both *for the first 90 days* of the crop duration and *after 90 days* of crop duration. This was important to test the claim of Mahyco-Monsanto that the Bt effect lasts on the crop for 90 days and after that period it wears off. To what extent this effect works was an important determinant in the study.

This data could not be collected for all the farmers, since many of the farmers either do not have recorded data or could not specifically recall the timing of the pesticide sprays. But for at least fifty farmers, about 20 per cent of the sample size, this data was available. This data was separately analysed in order to understand the pattern of pesticide consumption in two spells, i.e., for the first 90 days and after 90 days.

From the table 6 it is clear that there was no difference in the usage of pesticides on both sucking pests as well as on bollworms, either for the first 90 days or after 90 days. Look at the figure on the expenditure for bollworm control during the first 90 days. The difference is just Rs.7 which works out to barely 1.5% of the total pesticide expenditure on bollworm control. THE CONTROL Of BOLLWORM DURING THE FIRST 90 DAYS IS THE RAISON D'TRE *OF BT COTTON. This figure shows that Mahyco-Monsanto bt hybrids totally failed in this aspect and therfore completely belie the industry's claim that Bt will reduce bollworm attack in the first 90 days.*

It was also evident from the table that usage of pesticides was more after 90 days of sowing of the cotton crop, that too mostly for the control of bollworms, both on Bt and non-Bt crops. This clearly shows that consumption of pesticides was more on bollworms after 90 days of the sowing of the crop. ***Bt did not offer any protection for this phenomenon. If it tries to do that it significantly***

increases the chances of development of early resistance in pests, thereby making Bt even more ineffective.

6.2 Year 2003-04

Though it did not openly admit to the total failure of its MECH 162 in 2002, Mahyco-Monsanto brought a new Bt hybrid MECH Bt 12 into the market in 2003-2004.

The 2003-2004 season-long study was conducted in 27 villages across three districts of Andhra Pradesh, eliciting data from 164 farmers at fortnightly intervals. The data collected from the farmers is presented in summary form in a table below, followed by a discussion on specific aspects.

6.2.1 Seed cost

Bt cotton seed was sold in the open market for Rs 1600 per packet of seeds along with refuge seed, which is sufficient for one acre. Later, the Government of Andhra Pradesh had allowed the sale of these Bt cotton hybrids through its outlets in the market committees at a subsidized price of Rs 1200 per packet. Some of the sampled farmers purchased the seed in these outlets, hence the average cost of seed for Bt reduced to Rs 1499, Rs 1487 and Rs 1368 for small, medium and large farmers respectively. There was no reduction in the price of non-Bt hybrids as compared to the open market.

6.2.2 Plant protection costs for Bt and Non-Bt crops

In India, cotton crop consumes more than 50 per cent of total pesticides consumed. In districts like Warangal, where the cotton crop is extensively grown in the same fields year after year, the average market for pesticides is worth more than Rs 80 crores (Rs 800 millions) per year. Though the volumes of spray came down with the advent of new proprietary pesticides such as Avaunt by Du Pont and Tracer by DE-Nocil the actual costs on pesticides shot up. Irrespective of Bt or non-Bt, all farmers sprayed these high-cost pesticides on their crops for managing American Bollworm.

6.2.3 Cost of bollworm management

Three species of bollworms attack cotton at different stages of crop growth and cause significant yield reduction during severe outbreaks. They are spotted bollworm, American bollworm, and pink bollworm. Spotted bollworm attacks cotton plant in the early stages between 20 to 45 days, American bollworm attack starts from 50 days and continues till 140 days of the crop growth followed by pink bollworm from 120 days till 200 days. American bollworm is the major pest on cotton in all the areas where the study had been conducted.

The study revealed that large farmers had sprayed more pesticides, followed by small and medium categories, for both Bt and non-Bt crops. The difference between the cost of bollworm management

Table 6: Use and cost of pesticides for the first 90 days and after 90 days of crop duration in 2002-03

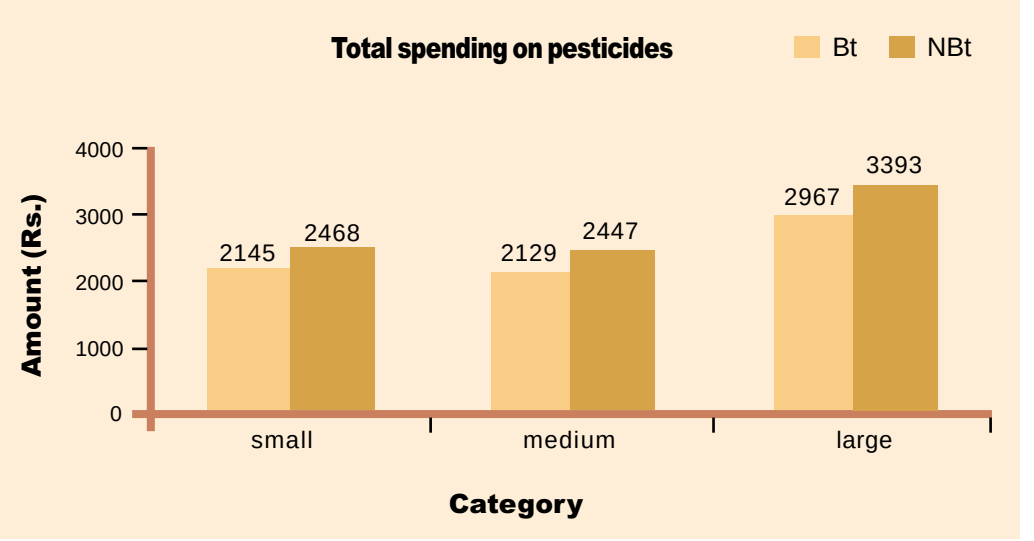
Sl. no	Pest on which chemical spray was taken up	Cost of plant protection on Bt			Cost of plant protection on Non-Bt		
		First 90 days (Rs)	After 90 days	Total cost (Rs)	First 90 days	After 90 days (Rs)	Total cost (Rs)
1	Sucking pests	955 (30%)	86 (3%)	1041 (33%)	998 (29%)	102 (3%)	Rs 1100 (32%)
2	Bollworms	432 (13%)	1713 (54%)	2145 (67%)	439 (13%)	1871 (55%)	Rs 2310 (68%)
3	Total	1387 (43%)	1799 (57%)	3186 (100%)	1437 (42%)	1973 (58%)	Rs 3410 (100%)

Table 7: Economics of Bt and Non-Bt cotton cultivation in 2003-04

S no	Parameter	Farming categories									Average of all farmers		
		Small farmers			Medium farmers			Large farmers					
		Bt	Non-Bt	Gain for Non-Bt	Bt	Non-Bt	Gain for Non-Bt	Bt	Non-Bt	Gain for Non-Bt	Bt	Non-Bt	Gain for Non-Bt
1	Seed cost (Rs/acre)	1499 (12%)	468 (4%)	+1031	1487 (12.5%)	452 (4%)	+1035	1368 (11.6%)	380 (3.6%)	+988	1469 (12.2%)	445 (4%)	+1024
2	Cost of bollworm management (Rs/acre)	1452	1922	-470	1322	1730	-408	2074	2565	-491	1516	1964	-448
3	Cost of sucking pest management (Rs/acre)	693	546	+147	807	717	+90	893	828	+65	778	670	+108
4	Total cost of pest management (Rs/acre)	2145 (17.5%)	2468 (21.4%)	-323	2129 (18%)	2447 (22%)	-318	2967 (25%)	3393 (32%)	-426	2287 (19%)	2608 (23.4%)	-321
5	Total cost of cultivation (Rs/acre)	12253	11527	+726	11938	11031	+907	11763	10497	+1266	12030	11127	+903
6	Yield (quintals/acre)	8.16	8.0	-0.16 q	8.65	9.16	+0.51 q	7.67	6.0	- 1.67 q	8.27 q	8.0	-0.17 q
7	Net profits (Rs/acre)	6880	7451	+571	8698	11179	+2481	6967	4302	-2665	7650	8401	+751
8	B/C ratio	1.56	1.65	+0.09	1.73	2.01	+0.28	1.59	1.41	- 0.18	1.64	1.76	+0.12

** Note: Figures in parentheses indicate the percentage to the total cost of cultivation*

Chart 1: Total spending on pesticides across farming categories in 2003-04



in Bt and non-Bt crops was Rs 470, Rs 408 and Rs 491 for small, medium and large farmers respectively. A close look across the three farming categories clearly shows that the net difference in the cost of spraying pesticides between Bt and non-Bt crops was less than Rs 500.

Very significantly, for small farmers, this difference was just about Rs.300/acre, less than 13% of their total pest management costs.

It was observed that in the early stages of crop growth, though the consumption was less on Bt crop for managing bollworms, as the age of the crop advanced, both Bt and non-Bt required the same number of sprays.

6.2.4 Cost of management of sucking pests

Five different species of sucking pests attack the cotton plant. They suck the sap from the plant and reduce the physiological activities of the plant, severely affecting yield. The common sucking pests that attack cotton are jassids, aphids, white fly, mites and red cotton bugs

The study clearly indicates that Bt crop required a greater number of sprays for managing sucking pests than the non-Bt crop. The difference was more for small farming category (Rs 145) followed by the medium category (Rs 90) and then large farmers (Rs 65). Farmers across all the districts opined that Bt in general was more attacked by sucking pests compared to non-Bt crop.

6.2.5 Total cost of pest management in cotton

Generally bollworm and sucking pests cause major economic damage to the cotton crop. Besides these two groups, other diseases like wilt, bacterial leaf blight, leaf spot, etc. also require some fungicidal sprays. But in reality, farmers avoid fungicidal sprays as they feel that these problems would not cause any economic damage, and resort to spraying only when it is warranted.

The total cost of pest management for non-Bt was 14 per cent (Rs 321) higher than Bt crop, which is marginal for a cotton farmer occupying as it does, less than 3% of the total cost of cultivation..

The category-wise total spending is presented in the Chart 1.

The above chart clearly reveals that the large farmers had spent more on plant protection, followed by small and medium farmers. A close look across categories clearly shows that the net difference in spraying costs between Bt and non-Bt cotton was less than Rs 450 for all categories, which is not even sufficient for one spray, according to the existing cost of pesticides that are used for managing the bollworm. The reduction in the total spending on the pesticides was in fact less

than Rs 350 for the small and medium farming categories.

It is further observed that large farmers had spent 37 to 39 per cent higher than their respective counterparts under both Bt and non-Bt groups with no special advantage in yield. This may be attributed to managerial lacunae. In the medium and small farmers category, spraying is done by the family members themselves and is therefore expected to be more efficient.

6.2.6 Total Cost of cultivation of both Bt and Non-Bt crop

The total cost of cultivation was arrived at by summing up all the costs paid for seed, fertilizers and manures, irrigation, plant protection, picking & transport of seed cotton including the contribution by family labour. The results clearly show that the total cost of cultivation was 8% (Rs 903) more per acre for Bt cotton as compared to non-Bt cotton.

Though Bt cotton was touted with the claim that it would reduce the total cost of cultivation by reducing the number of sprays and thereby cost of pesticide consumption, it totally failed in fulfilling this promise. ***It in fact increased the cost of cultivation for all category of farmers.***

From Table 7 it is very clear that across all the categories of farmers, the cultivation costs were higher for Bt cotton compared to non-Bt cotton. The differences are Rs 726 for small farmers, Rs 907 for medium farmers, and Rs 1266 for large farmers. It was observed that though there was slight reduction in the cost of cultivation, the high cost of Bt cotton seed and higher dosage of fertilizers on Bt crop resulted in higher cost of cultivation for Bt cotton. Another possible reason for increased cost of cultivation for large farmers was that they generally employ labour for handling pesticides and other crop management operations with lesser efficiency as compared to owner-workers.

6.2.7 Seed cotton yield

Cotton is a highly commercialized crop, due to its lint value in the textile industry. In India, besides seed cotton, cottonseed oil and cake also are of economic value. Normally yields start in the month of November and continue till March. Picking is done as and when the locules are fully open and this process is staggered over a period of 3-4 months.

The average seed cotton yield in Andhra Pradesh in the year 2001-2002 was 8.85 (Season and Crop report of Andhra Pradesh 2001-2002) quintals[885 kgs] per hectare. The average yields for Bt and non-Bt cotton as revealed in this study were 8.27quintals [827 kgs] and 8.1 [810 kgs/ acre] respectively, meaning that the average yield per acre from Bt cotton was just 17 kilos more than non-Bt hybrids under extremely favourable weather conditions.

The study revealed that the yield difference between Bt and non-Bt cotton among the small and medium categories was very low, but in the case of large farmers Bt cotton recorded a higher yield of 7.67 quintals per acre as compared to the 6 quintals of non-Bt cotton.

6.2.8 Net benefits

The returns from cotton cultivation largely depend on the market price of the seed cotton. During the period of this part of the study (rainy season of 2003-2004), rains were timely and the overall performances of cotton crop, not only in Andhra Pradesh but all over India, were very much in favour of farmers.

Despite the wide publicity given to Bt cotton hybrids that they would reduce the total cost of cultivation, reduce the pesticide sprays, and thus improve the yields, the net benefit is more for the non-Bt farmer than a Bt farmer. ***The Bt farmer earned a net amount of Rs 8401 per acre, whereas a Bt farmer earned Rs 7650, i.e., the non-Bt farmer on an average earned Rs 751 more than his counterpart per acre of cotton cultivation (Refer Table 7) .***

6.3 Year 2004-05

The data collected from the 220 farmers on fortnightly basis were collated and the economics of cultivation as shown in Table 8 have been arrived at. Some of the salient head wise data is later presented in graphical form for easy understanding. Out of the total 220

farmers, 106 farmers grew Monsanto hybrids (MECH-12, MECH-162 and MECH-184) and the remaining 114 farmers grew Rasi hybrid (RCH-2 Bt). All these farmers had also grown non-Bt hybrids (more than 90 hybrids were grown by the farmers in the sampled area). The details of cost of cultivation are presented in table 8.

6.3.1 Cost of Seed

Cotton being a high-value commercial crop, farmers purchase hybrid seed every year. The Bt cottonseed was more than 300% costlier than non-Bt hybrids. Each packet contains 450g of Bt hybrid cottonseed, alongwith a 120 g of refuge non Bt seed sufficient for sowing in one acre of land. The study revealed that it is evident that Bt farmers spent around Rs 1600 per acre, whereas non-Bt farmers spent around Rs 500 per acre on seed (Refer Table 8).

6.3.2 Cost of pest management in Bt and Non-Bt hybrids

As in the previous year, the study showed that in this year as well, irrespective of Bt or non-Bt, all farmers sprayed high cost pesticides like Avaunt and Tracer on their crops for managing American bollworm.

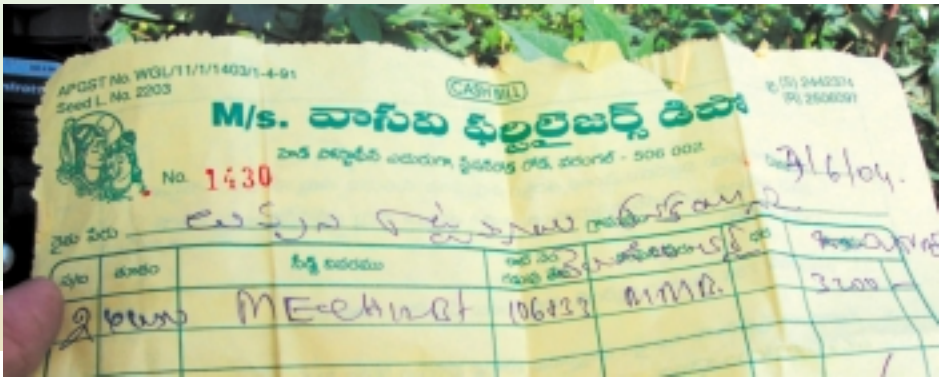
During this year, moderate infestation by American bollworm was observed compared to the preceding years. The meteorological data shows that the minimum temperatures fell below 16^0C from the second fortnight of November 2004 and the trend continued till early January 2005. Generally American bollworm activity reduces under such low temperatures. Further, during the dry spell of August and September, the maximum temperatures were between 36^0C and 38^0C and this also might have affected the hatching rate of the eggs of heliothis (American bollworm). However, higher pink bollworm infestation was noticed during this crop season, damaging the quality as well as the yield of cotton in the last lap of the season in both the groups of hybrids under study.

As the 2004-2005 study homed in on capturing the impact of growing Monsanto's Bt hybrids on the overall economics of small and medium farmers, the data is presented for both categories. Under each category, the results of all farmers in respective categories (small & medium) are compared with:

a) the results of the total farmers who had grown Monsanto hybrids in that category, and
b) with farmers who had grown both Monsanto Bt and Non-Bt hybrids under rainfed conditions

The study area falls under the Telangana region of Andhra Pradesh, where majority of the cotton is grown under rainfed situations. The overall performance of rainfed farmers *vis-à-vis* all farmers with Monsanto hybrids is compared in the following charts.

From the chart 2 it is evident that, Non Bt hybrids required lesser amount for spraying compared to Monsanto Bt hybrids. For all small farmers there was



Cash receipt showing higher price of Bt cotton - Proof of genuineness

Though the farmers' agitation was made out as a consequence of using spurious seeds, farmers had used authentic seeds and had their proof

Seeds of Violence

Moglicherla Village in Moglicherla Mandal of Warangal was suddenly in the news in early 2005. Angered by the total failure of Bollgard cotton in hundreds of acres in their village, the farmers from Moglicherla held the Mahyco Monsanto representative hostage in their village. He had to be rescued by the police and escorted out of the village.

The next day the villagers went to Warangal City and in a spontaneous, violent protest, destroyed seed depots and set some on fire. They had lost all hopes in the seeds, seed dealers and the government apparatus. They called upon the insurgent Peoples War Group to come and rescue them from a situation where the government in league with the multinational seed corporations was subverting the evidence regarding the crop failure and was turning a blind eye to the ruination of the Bt farmers in their village.

The media, as usual, said it was a case of spurious seeds while in actuality, the farmers of Moglicherla had bought authentic cartons of seeds from authorised dealers of Mahyco-Monsanto and were producing proper receipts for their purchase. Once again, the corporate power had succeeded in overturning a human misery.

Listen to the farmers of Moglicherla. How a genuine grievance, uncared for, turns into violence.

Atchula Tirupati says...

This is pachi mosam [Abject injustice]. Done in broad daylight. Thieves come in the night, but these corporate robbers have robbed us in daylight. Right in front of our eyes, they have snatched away Rs.1600 from our pockets. 450 gms. 1600 rupees.

In some of our houses, our wives are not giving us food. Because all this pettanam [extravagance] is by men. Men are profligate [in bringing Bt] and women work 24 hours. Ultimately there is no boll in the field, no cotton in hand. What to do?

If we had grown groundnut, turmeric or any other cotton, we would have earned more than 50,000 rupees. Brahma, Sigma, Tulsi, whatever cotton, we would have got 30 quintals [3000 kgs] yield. With this Bt there was no question of any yield. The bolls emerged just so small[shows his fingers] and dried up with the plant. The very first bolls have given us 4-5 handbags of cotton. That is all.we got.

One or two bolls only. They [Mahyco-Monsanto] people checked all these [swings his hands around to show a vast area] fields. Then they [Mahyco-Monsanto representtive] came from Hyderabad in a Sumo [a local model of jeep] and inspected these fields. We asked them "what is the matter sir" and made him stay in the village until 8-9 in the night. "Give us in writing that you will come back on a certain day" we said and contributed ten rupees each and bought a stamp paper. He said "I am not allowed to sign". We asked him,

...continued in page 19

"why are you saying so?" He said, "you can keep me here as many days as you want. If you want, I will leave my vehicle here". We said "we have nothing to do with your vehicle. Just sign on this paper." "If I sign, I will not be alive", he said. Then we let him go. Then came the Geesukonda yessaiah [SI, sub inspector of police]

Sarpanch Venkam Naidu says...

My farmers said SI came. It was not the SI. It was the Circle Inspector who came. How many days will they escort the seed merchants, how long will they abandon farmers, we will also see. Why are they supporting businessmen? Why not farmers? We know those businessmen. They were walking the streets once. Now they are millionaires. Where did they get their money. By robbing farmers, is it not?

"Look at these bills. We also have the original seed cans. Look, this is the seed can."

We bought pesticides for rs.610 yesterday. We have been spraying constantly. We have to irrigate this for another month or more.

Golla Sailu says...

We are seeing for so many years. No seed dealer, no businessman committed suicide. It is only the farmers [who committed suicide]. Hundreds every year. Which government has taken steps to save farmers from this? This year 500 farmers planted this [Bt] here. Noone had a good crop. All of us are holding our heads in our hand. All of us are in great fear. We have borrowed at huge interest rates: 36%, 48% and bought powerful pesticides like Avaunt, Tracer. That too in black market. At Rs.1000 per tin. On this field we have spent upto Rs.10,000 per acre. We cant even recover Rs.2000.

Sankatala Parmeshwar says...

We have worked so hard on this crop. Spending on everything. Weeding, Pesticides, some of us don't have bullocks. Hiring all of them. Therefore we went to the seed dealers, brought them here, showed our fields. Then they said, we will send a team with the Monsanto company people. The team came, we walked around with them. They said they will inform their superiors. We held them back till the night. We could have beaten him up. But why would we? We have borrowed and invested. Can they at least return our investments?

... as narrated to our camera team

Post Script :

In at least 25,000 acres, farmers used Mahyco's Bollgard seeds At many places crops were damaged even at flowering stage. Compared to other cotton varieties Bt yields are hopeless. Realising that they were cheated again by seed companies, farmers today. destroyed seed shops in Warangal and burnt their hoardings. There was a big tussle between farmers and the police. Though the governments changed farmers conditions have not, farmers alleged. At least Naxals [insurgent groups] must help us, demanded farmers. In Warangal District farmers have lost over ten million rupees. That Mahyco seeds have totally failed is completely true.

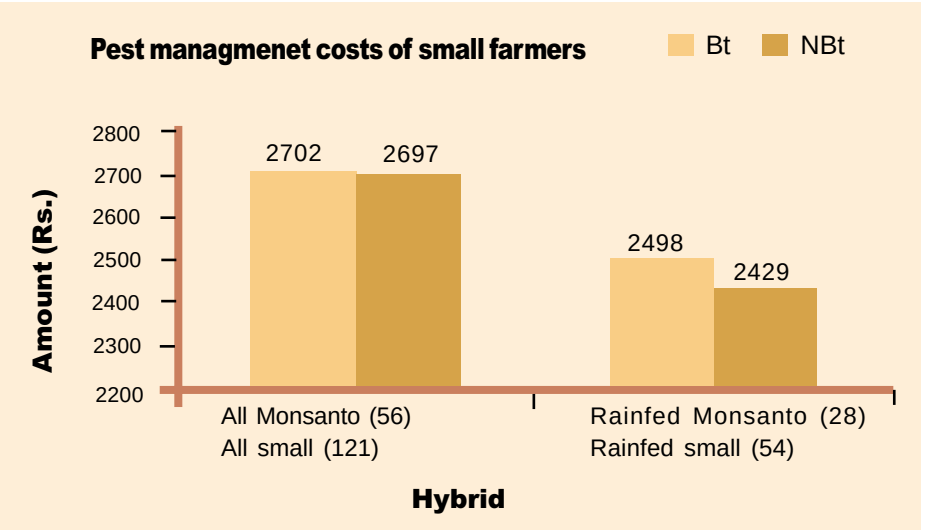
MAA TV NEWS, October 15, 2004
MaaTV is a regional Telugu TV news channel

Table 8: Economics of Bt and Non-Bt cotton cultivation in 2004-05

MECh Bt 12, 162, 184 & all Non Bt hybrids (All costs in Rs/ acre and Yields in Kgs / acre)

	All small farmers		Irrigated small farmers		Rainfed small farmers	
	MECH Bt	NON-BT	MECH Bt	NON-BT	MECH Bt	NON-BT
Check NBt no under irr & rf	n=56	n=121	n=28	n=67	n=28	n=54
Seed	1603	510	1607	515	1600	504
Fertilisers	2166	1956	2672	2152	1659	1713
Pl protection	2702	2697	2905	2913	2498	2429
Total costs	12079	10136	13819	11002	10339	9061
Yield	650	644	765	612	534	683
Gross returns	11116	11103	12612	10116	9620	12327
Net returns	-963	967	-1207	-886	-719	3267
	All medium farmers		**Irrigated medium farmers**		**Rainfed medium farmers**	
	MECH Bt	NON-BT	MECH Bt	NON-BT	MECH Bt	NON-BT
	n=43	n=81	n=35	n=57	n=8	n=24
Seed	1603	498	1603	504	1600	483
Fertilisers	2317	2087	2483	2308	1594	1561
Pl protection	2388	2690	2404	2884	2319	2231
Total costs	12342	10469	12824	11328	10233	8430
Yield	706	640	762	665	464	579
Gross returns	12864	10823	13934	11101	8181	10163
Net returns	523	353	1111	-227	-2051	1733
Total farmers						
	All farmers		**All irrigated farmers**		**All rainfed farmers**	
	MECH Bt	NON-BT	MECH Bt	NON-BT	MECH Bt	NON-BT
	n=106	n=220	n=66	n=133	n=40	n=87
Seed	1602	505	1605	510	1599	498
Fertilisers	2201	2028	2551	2258	1623	1677
Pl protection	2510	2717	2562	2973	2425	2325
Total costs	12081	10298	13192	11263	10247	8822
Yield	669	635	768	639	506	629
Gross returns	11828	10894	13487	10644	9092	11277
Net returns	-252	597	295	**-619**	-1155	2455

Chart 2: Cost of pest management for small farmers in 2004 - 05



negligible difference in the pest management, in fact it was less for Non-Bt hybrids, whereas under rainfed situations, Monsanto hybrids required Rs 69/- more than the Non-Bt hybrids.

This completely belies the argument of the industry that Bt hybrids reduces the spraying cost. (Refer Table 8)

Seed of Death

Hachya was a beautiful woman from Dasharathpally Tanda of Narsampet Mandal, at the prime of her life. With two young children and a drunken husband, life was becoming miserable for Hachya. In order to escape from her life of poverty, Hachya was looking for an escape route. The Bollgard cotton which entered her district with a tremendous hype was the escape route she chose. Keeping her trust in Bt cotton, Hachya took a two acre farm on lease and planted Bollgard cotton from Mahyco-Monsanto. She did not know that she was planting the seeds of her death.

Hachya

Her dead body

"From this field, straight all through this is two acres. It rained then. Just the first sprinkle. Ordinary rain. They got the land ploughed and sowed seeds. Then the sun shone fiercely. No plant germinated. They wanted to irrigate, but had no water. "What shall I do now? I have spent Rs.3200 [on seeds] and Rs.200 [travel]. I have no more money left. I have been a farm labourer and lived on it. I have two small children. My husband is a drunkard. Vagabond. What shall I do now?" she said and around 5-30 p.m. drank pesticide at home.
"We were all panicky. We took her to Narsampeta. By the time we reached [the hospital] she was dead." "That was Bt."

Narrated by : Eerya, Dasarathpally Tanda

In the medium-farming category (chart 3), the pest management costs were high for Non-Bt hybrids by Rs 302/- compared to Monsanto Bt Whereas under rainfed conditions, Monsanto hybrids consumed Rs 88/- more than their corresponding Non-Bt hybrids. Charts 3 & 4 unfold a very interesting outcome of this whole argument of opting for Bt cotton. As per industry claims, by growing Bt cotton, farmers could reduce the usage of pesticides, thereby reducing the cost of cultivation. But the season-long study unequivocally reveals that the reduction in the pesticide usage did not compensate even for the extra amount charged for the Bt cottonseed. **Interestingly the reduction is not at all visible with Monsanto hybrids, especially under rainfed conditions, which account for more than 50 % of the total cotton area in the Telangana region**. Even after spending Rs 1100 more for the Bt Seed, the actual cost incurred on plant protection is not coming down but rising. The actual loss for growing Monsanto hybrids was found to be Rs 1100 plus the extra amount spent on pesticides vis-à-vis non-Bt hybrids.

Chart 3: Cost of pest management for medium farmers

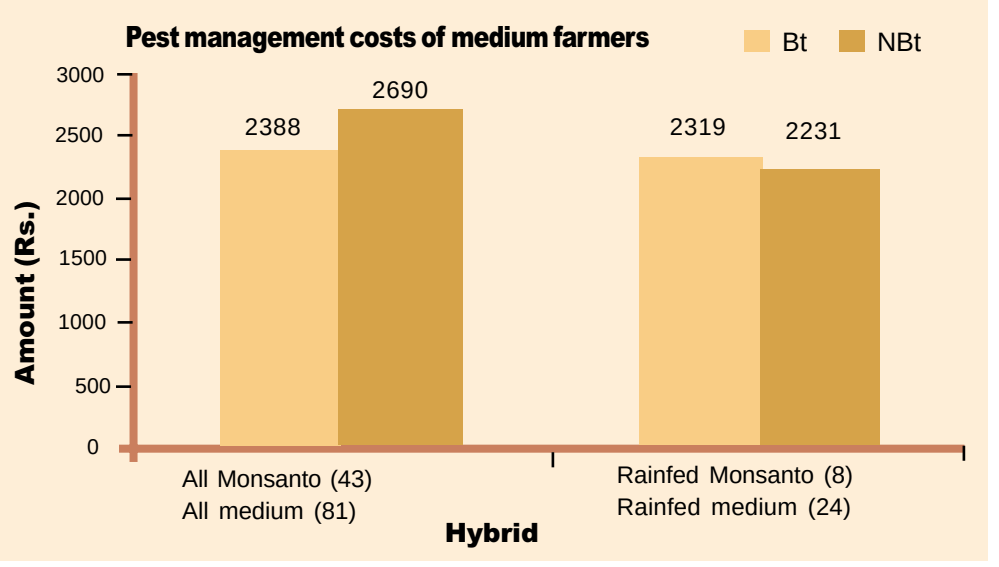
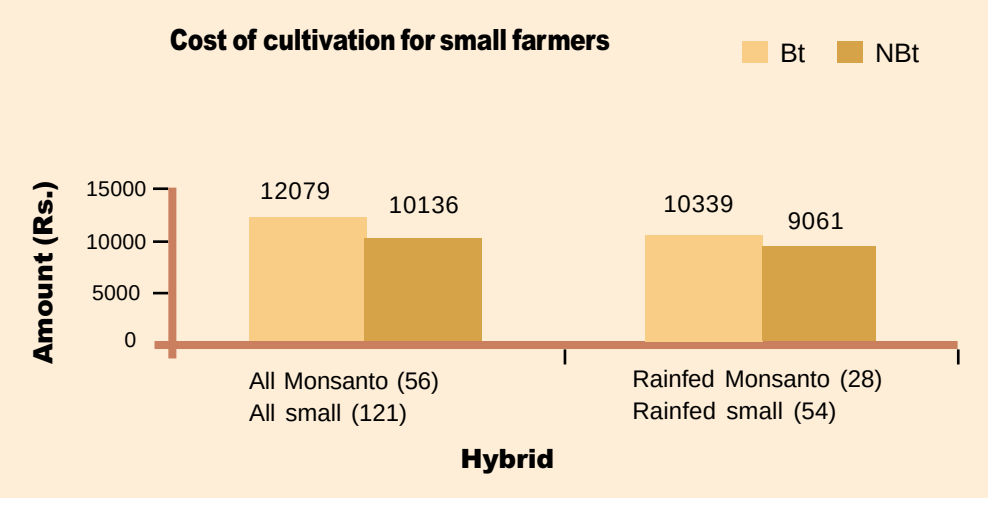


Chart 4: Cost of cultivation for small farmers in 2004-05



6.3.3 Cost of sucking pest management

In the small farmer category —Monsanto Bt hybrids involved more expenditure for managing the sucking pests compared to non-Bt hybrids. This concurs with the results of the first two years of the study, saying that sucking pest damage is more on Bt hybrids than on non-Bt hybrids.

The increase in pesticide consumption for managing sucking pests was more by Rs 92 and Rs 81 respectively in the order of small farmers with Monsanto hybrids, and small farmers with Monsanto hybrids under rainfed conditions.

As for medium farmers, a similar trend was observed. Medium farmers with Monsanto hybrids, and medium farmers with Monsanto hybrids under rainfed conditions—experienced higher costs on Bt as compared to non-Bt by an average amount of Rs 131, and Rs 68 respectively.

6.3.4 Cost of bollworm management

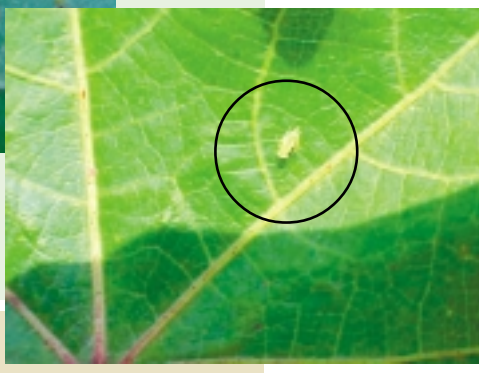
Bt cotton, according to its votaries aims at protecting the cotton crop from bollworm infestation. In cotton, bollworms cause more damage right from 50-60 days of sowing till 200 days after sowing. Bollworm infestation starts with early shoot borers at the age of 20-60 days after sowing, followed by American bollworm from 50-160 days of sowing, and pink bollworm from 140-220 days after sowing.

The expenditure incurred by the small farmers shows that non-Bt hybrids involved higher costs on plant protection for managing the bollworms to the tune of Rs 209, and Rs 509 for Monsanto farmers in the small farming category and farmers growing Monsanto hybrids under rainfed conditions respectively.

A similar trend for all medium category (table 8) farmers with Monsanto hybrids, while in the rainfed conditions a reverse trend was observed. There was

Aphids were aplenty on Bt cotton

Though incidence of Heliothis was a shade less than before, its place was taken up by other sucking pests like aphids



Jassids attacked Bt plants

Another pest that the Bt plants hosted was Jassid, which considerably damaged them

a reduction of Rs 115 on bollworm management for all medium farmers with Monsanto hybrids, whereas under rainfed conditions, non-Bt hybrids required Rs 237 less than Monsanto Bt hybrids for managing the bollworms.

6.3.5 Irrigation costs of Bt and Non-Bt hybrids

Cotton crop is best suited to the black cotton soils with good irrigation. In the irrigated belts of Warangal, Karimnagar and Nizamabad districts in the Telangana region, farmers get reasonably good yields of cotton crop. As the cotton crop has an assured market with minimum support price, many farmers with soils not suitable for cotton also started cultivating cotton, even under rainfed conditions. Another important reason for the increase in cotton acreage is the availability of crop loan credit for the farmers from private lenders, usually the input suppliers such as seed, fetilizer and pesticide dealers.

During the study it was found that farmers had applied preferential irrigation to their Bt crops at critical stages of crop growth by either delaying or denying the irrigation for the non-Bt crops. This was clearly observed in the case of Monsanto hybrids. A cursory look at the total costs of irrigation for Monsanto hybrids vis-à-vis conventional hybrids shows that Bt crop was provided with 18% more amount on irrigation compared to the conventional hybrids

(Refer table 8).

6.3.6 Total cost of cultivation of Bt and Non-Bt hybrids

6.3.6.1 Cost of cultivation of small farmers

Contrary to the industry's claims about saving of 30% by growing Bt cotton, the study shows that the cost of cultivation shot up by 16% (Rs 1943/-) for all small farmers with Monsanto hybrids Whereas under rainfed conditions with Monsanto hybrids the total costs went up by 13% (Rs 1278/-).

Where the Heliothis left, Pink Bollworm took over

Though there was no significant reduction in the American Bollworm pest population, Pink Bollworm damage was extensively reported from the field. Actually farmers coined a term to describe it: *Guddi Patti* (Blind Cotton)

6.3.6.2 Total cost of cultivation of medium farmers

A similar trend of increased costs of cultivation when growing Bt cotton hybrids was observed in the medium farmer category as well. The average total costs of cultivation shot up by 15% (Rs 1873), and 18% (Rs 1803) for all medium farmers who had grown Monsanto hybrids, and all medium farmers under rainfed conditions respectively (Refer Table 8).

The charts 4 & 5 clearly show that with Monsanto Bt cotton the total cost of cultivation **actually increases**, as against the claims made by the industry.

6.3.7.1 Seed cotton yield for small farmers

Cotton yields generally start in the month of September and continue till March, depending on the availability of irrigation and sowing time. Under rainfed conditions, cotton crop would complete its final yield by the month of January, whereas in irrigated areas yields continue till March. Cotton crop is harvested as soon as the locules are fully open. The seed cotton is handpicked from the plant and sun-dried before marketing to reduce its moisture percentage, as the higher moisture levels spoils the seed cotton during storage.

From the Table 8, it is very clear that, the yield advantage for "all small farmers" category was negligible with Monsanto Bt hybrids (just 6 kilos more) *vis-à-vis* Non-Bt hybrids. Under Rainfed conditions, the yield advantage with Non-Bt hybrids was quite visible. **Non-Bt hybrids out performed Monsanto Bt hybrids by about 1.5 quintals (149 kilos).**

It is to be noted that, Monsanto hybrids did not perform under stress situations even after spending more seeds and fertilizers.

6.3.7.2 Seed cotton yield for medium farmers

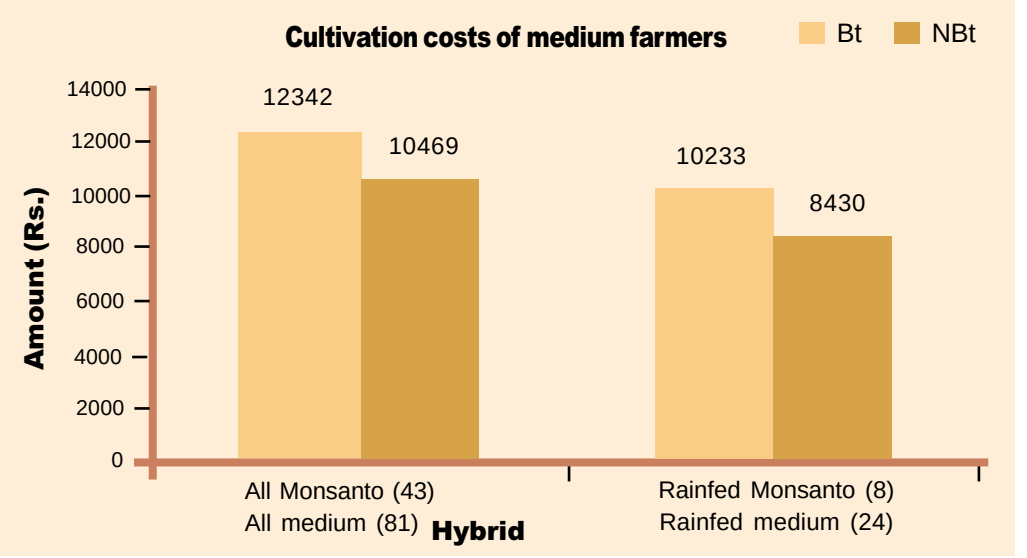
In the medium farming categorythough the yields were on the positive side for all medium farmers with Monsanto hybrids with an increase in yield of 10 % over the Non-Bt hybrids, the trend was reversed with the same Monsanto hybrids under rainfed situations by yielding 24 % lesser yields than the Non-Bt hybrids (Refer table 8).

The findings drive home a very important finding: under rainfed situations, the Monsanto Bt hybrids failed farmers by not reducing the expenditure on pesticides, and increasing the total costs of cultivation and by yielding poorly *vis-à-vis* non-Bt hybrids.

6.3.8 Net income from Bt & Non-Bt hybrids

From the chart 8, it is very much evident that, Non Bt hybrids performed better than the Monsanto's hybrids both with "all small farmers" and "small farmers under rainfed conditions" categories.

Chart 5: Cost of cultivation of medium farmers



Monsanto hybrids resulted in a net loss of Rs 963/- and 719/- respectively in the above categories where as Non-Bt hybrids resulted in a net gain of Rs 967/- and Rs 3267/- respectively for the same categories. It is to be noted that, Non-Bt farmers under rainfed situations gained more profits than all other situations described above. The lower investments on Non-Bt crop in rainfed situations might have translated in to higher net profits.

The cotton crop through out the study areas was subjected to prolonged dry spell during the crop growth period in the months of August and September 2004, severely affecting the plant physiological characters, and decrease in prices of seed cotton with increased cotton acreage during the season. Farmers with assured irrigation facilities could save their crops by giving life-saving irrigations during the prolonged dry spell, thus escaping the effect on the plant growth. ***Even other small farmers in rainfed areas, purchased water to give one or two irrigations to Bt cotton while they denied the same to their non Bt cotton. This is borne out from the filmed interviews of the farmers.***

Generally farmers had applied more fertilizers and a greater number of irrigations for Bt crop compared to non-Bt crop. This escalation in costs could have resulted in the higher losses from Bt hybrids. In addition farmers were of the opinion that Monsanto's hybrids were more sensitive to the drought situation, and wilted severely under prolonged rainfed situations. This is in conformity with the observations made in earlier studies.

The above chart reveals that in the medium farmers category, Monsanto farmers benefited by Rs 170/- from Monsanto Bt hybrids than the Non-Bt hybrids. Whereas in the rainfed conditions, all medium farmers suffered a huge net loss of Rs 2051 vis-à-vis Rs 1753 from Non-Bt hybrids, a difference of Rs 3784.

From the above charts 6 & 7, it is very clear that Monsanto Bt hybrids failed under rainfed situations both for small and medium farmers, almost identical with the observations recorded in preceeding 2 years.

6.3.9 Specific observations:

1. Cost of seed: Many farmers had to borrow money to pay the cost of seed of Bt.Hybrids that is 3 to 4 times higher than local hybrid seed. Therefore these hybrids are driving the farmers to the debt trap from day one. The frequent long dry spells at sowing causes failure of germination and farmers had to bear heavy loss from the beginning. The loss of N.Bt. hybrids is just 25% of Bt hybrids, even if failure is total.

2.Growth: Growth was normal in both Bt and NBt. hybrids.

Chart 6: Net income for small farmers for 2004-05

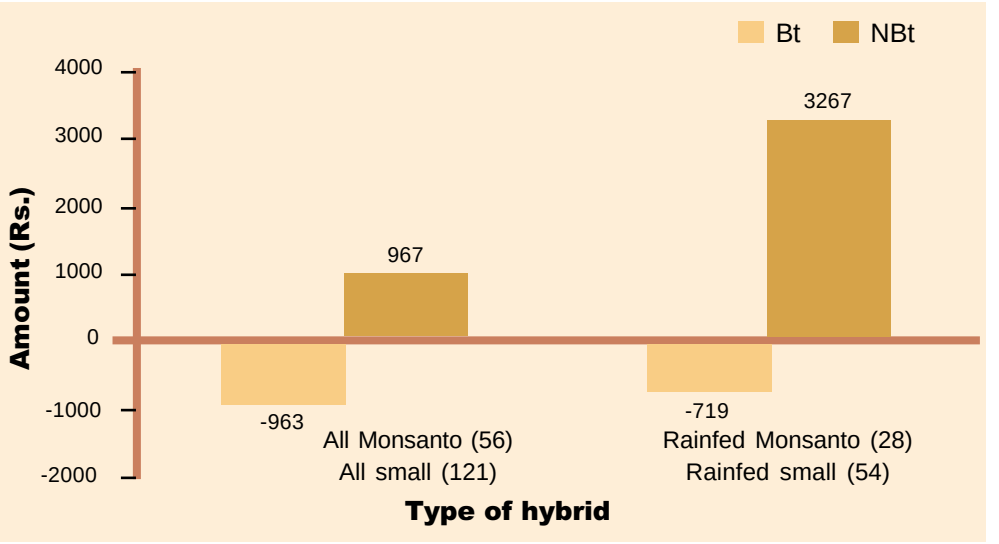
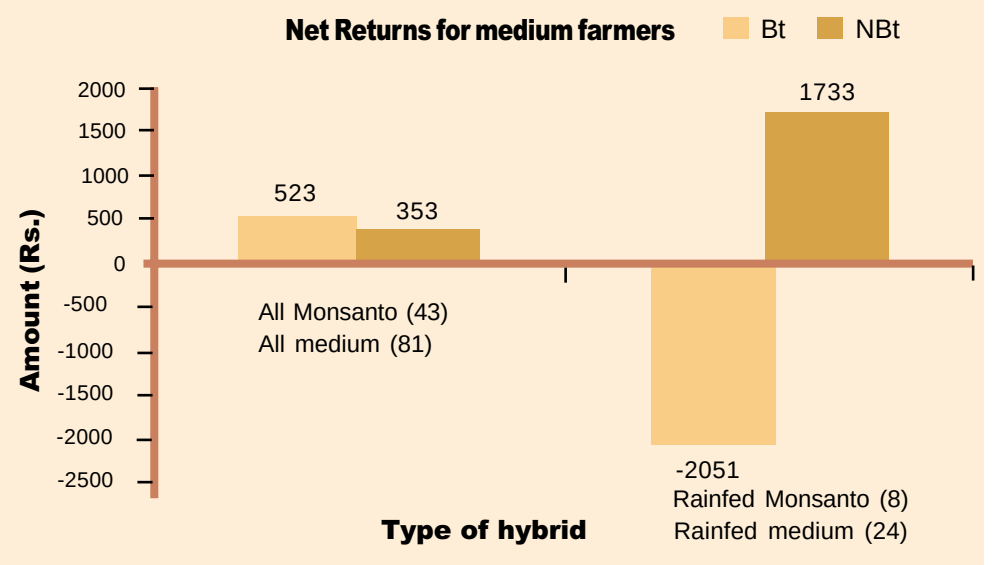


Chart 7: Net income for medium farmers in 2004-05



3. Flowering: As in the past MECH Bt. hybrid was early in putting out buds, flowers and bolls compared to Non.Bt hybrids. This earliness does attract the Heliothis moths for oviposition on both Bt. and refugia facilitating early multiplication of the pests leading to their early establishement. Many farmers had confirmed this during our survey. Consequently by the time NBt. hybrids did bear flowers etc. the Heliothis caterpillars established themselves. These include the Heliothis that might have developed resistance to Bt. during the past two years (almost 12-15 generations) and invade not only neighbouring NBt.cottons but also other hosts. Thereby this advance population poses a challenge for other farmers. The impact of this advanced population has to be studied by the ICAR institution.

4. Boll dropping: As was observed during 2003-04 boll dropping was 30% to 40% in MECH12 Bt hybrid during their developing phase without any external or internal damage symptoms. The abscission

Bolls were not guarded in Bollgard

Excessive Bollgard dropping was a major source of concern for farmers in 2004

Somakka

Somakka in her forties, lives in Wanaparthy village in Sangam Mandal of Warangal District. Like most farmers of her district, Somakka has been growing cotton for years. She has hardly lost from her cotton cultivation. Until she planted Mahyco-Monsanto's Bt cotton in 2003.

"They Bollgard people advertised that they are selling seeds in Jangaon. I went to buy some seeds there. When I went there, about ten people had bought these seeds. They were telling about no need for spraying. So I thought, we can also save on spraying and bought this seed. "Yields very well. Upto 10-15 quintals" they were saying. I also bought one packet for Rs.1550 and planted in one acre.

Somakka

"I am not feeling good about it now. The bolls look good. But are dropping from the stem itself. Look at this flower. It falls off from here. Bolls also drop from here."

"How many times did you spray?"

"Thrice. Both for Bt and Non Bt. Both have aphids.

"They said it will yield 15 quintals [per acre]. Until we saw this shedding, we thought at least we will get 7-8 quintals. Look at this square. It drops off from the stem itself. Bolls are not opening. This is also dropping. Day before lots of them dropped.

"They counted the flowers as if they will mature into bolls. There were lots of them when they came. Now see, all of them have dropped.

"They said there will be no pests on this, except for aphids. See, how the pests have bored into this. There are lots of these pests. But aphids are plenty.

"We also gave it two irrigations. And then it rained. The bolls started dropping. Then we suspected [something was happening]. But we cant understand why the bolls are shedding.

"What benefit is this for a farmer? There are pests, aphids and bolls, all together. And the bolls are shedding. How can we stop them?"

After two months when we met her again:

"Bt cotton is no good. All are guddi patti [damaged bolls]. Nothing will come out of this. Even seeds cannot be retrieved.

"Will we plant it again? How much have we profited this year that we plant this again?

"Rs.1600 for seeds hoping for good yields. We invested everything into this. Did we do anything less for it? When it started drying, we even gave it irrigation. Applied urea. Whatever we applied, it absorbed everything.

...continued to page 30

"Look at this guddi patti. When the bolls open, there is no good cotton. Looks like this. Guddi patti is more than 50%.

"We sprayed Rs.800 worth mandu, the same mandu for both of them. This [Bt] is also in an acre. That is [non-Bt] also an acre. This [Bt] costs more for seeds. Same pesticides for both. Still it got Pachapurugu [heliothis]. At Rs.400 a packet, we can sell 400 kgs [of non Bt]. And after spending Rs.1600 per packet [for Bt], how about selling 200 kgs of damaged cotton [Guddi Patti]?

Look here. What can be picked by four, is being picked by ten. By the time they pull the lint out of the boll, their fingers start hurting. Labourers who come today, refuse to return tomorrow.

Yields? A third of what they promised. They said, (the yield will be) 15 quintals, 12 quintals, at least ten quintals. We got four quintals. We gave three irrigations. Sprayed. Did everything. In fact gave one trip more fertilisers than Non Bt. Non Bt on the other hand gave very good yield. That grew without irrigation. Isnt there a difference between that [non Bt] and this [Bt]? Those who grew Non Bt are better off.

Will I plant it again and drown further?

Shall we buy seeds at Rs.1600 and plant it again? Now we lost Rs.8000. What we thought we would profit, we have lost.

Bt is no good. Can he come back again, can he sell his seed again?

~~~ as told by Somakka to our Camera

tissue (circular in shape) was noted at the node bearing the peduncles. If this genetic factor gets transferred during cross-pollination the loss will be considerable in case of NBt. hybrids. If this phenomenon is due to interaction of introduced gene with germplasm and other factors, then the risk of loss is much greater.

5. Rot in MECH: A number of MECH Bt hybrid plants started wilting as seen from drooping leaves at the age of 90-120 days after sowing. In rainfed Bt crop 20 to 40 % plants permanently wilted and though the remaining plants had borne new sprouting the bolls were few, shrivelled and dried. The roots of the wilted plants had most of the symptoms of Rhizoctonia root rot, which was not at all a common disease in the area. ***The fungus being soil borne may infest the succeeding cotton crop or chillies or other host crops. The fungus is also likely to spread through irrigation water to neighbouring fields whenever weather elements are congenial.***

Many farmers have already started feeling this effect on their soil and have extensively given evidence in their filmed interviews.

Rotting roots give rise to new fears
Rhizoctonia or Root Rot was a visible phenomenon in Bollgard crop, giving rise to fears that it must be spreading a new disease not seen until now

Wilt- A new melody on cotton was wide spread in 2002 Kharif, on MECH 162 Bt, the major hybrid supplied in that year by Monsanto-Mahyco.

In 2003-04 (Kharif) the symptoms similar to Rhizoctonia root rot were widely associated with MECH Bt 12. It was scarcely reported in the study area earlier.

6. Sucking pest: The MECH Bt. 12 seemed to have suffered more infestation and damage from sucking pests like jassids, aphids and to some extent the whitefly compared to NBt. hybrids, thereby warranting 2-3 more sprayings than the NBt. cottons. This was also recorded during last year (**2003-2004)** the problem was more severe this year. The result is that the overall economy in plant protection as claimed by the promoters of Bt. MECH12 is not at all perceptible. On the other hand other crops and cotton varieties run the risk of more damage when a major part of Bt.crop wilts and the pests disperse in search of new pastures to survive.

Wilting crop, wilting hopes
Thousands of acres of Bollgard crops just wilted away leading to angry and violent protests by farmers of Moglicherla

7. Monsanto hybrids Vs Non-Bt Cotton (with NPM)

Warangal is known for consuming huge volumes of pesticides, particularly on the cotton crop. At the same time the district is also well known among civil society organizations, NGOs and government circles as the place where several experiments and demonstrations are being conducted on alternative pest management approach without using chemical pesticides. This is popularly known as **Non-Pesticidal Management** of crop pests **(NPM).**

The NPM methods were developed on the basis of farmers' indigenous knowledge as an effective alternative pest management approach, using locally available resources and sustainable methods duely blending with latest scientific knowledge. This approach was fine-tuned by NGOs. **The basic principle underlying the approach is to strengthen the natural processes and restore the ecological balance, in order to contain the pest population within a level not harmful to crop and yields**. Though this approach is as yet in practice only in pockets, it is attracting farmers from all over. Facilitated by the local NGOs, the farmers have begun to successfully implement these NPM methods at a community level.

Under this approach no chemical pesticide is sprayed on the cotton crop. Alternative approaches such as spraying a mixture of fermented cattle dung and urine,

Lady bird beetle
Useful insect that feeds on aphids

neem seed kernel extract, chilly-ginger-garlic extract, erecting bird perches to attract predatory birds, pheromone traps, light traps, summer ploughing and application of NPV are practiced. All these methods are not only cost-effective but are also sustainable technologies and within the reach of all categories of farmers. The chances of insects developing resistance to these methods are very remote, whereas the chances of such resistance development is imminent in case of Bt cotton.

A good rainfall provides farmers good returns from the cotton crop, whereas frequent unfavourable weather conditions make them vulnerable and push them into a debt trap. Assured market for the cotton and readily available credit on the farm inputs enables farmers to choose this crop even in the rainfed areas. In Warangal district a number of NGOs, viz., MARI, PRAGATI, CROPS and SYO are promoting NPM methodology in cotton cultivation.

Janagaon Mandal in Warangal is an area with predominantly red soils with annual rainfall less than 700mm, not favourable for cotton cultivation. Nevertheless, farmers are more interested in cultivating cotton as it can be profitable. CROPS is an NGO promoting NPM methods in the cultivation of cotton in this mandal. Data from 10 farmers using NPM in a village called Enubai was collected and compared with

Pheromone Trap

Light trap

Simple cost saving eco-friendly methods

Studies by the NPM practices done by farmers using their traditional hybrids without chemical pesticides has added new hope to cotton cultivation

We believe, what else can we do?

Mekaleswari from Komala village in Ranganathpally Mandal is a wisened elderly woman nearing her sixties.Last year she had planted non Bt on her two acre farm and did very well. “Last year when I planed Tulsi [a non-Bt hybrid] in two acres, I got Rs.50,000”. But she wanted more. She thought Bollgard will answer her greed. She planted it in her two acres.

Mekaleswari

What did she get? Listen to Mekaleswari’s story.

“I planted Bollgard in two acres. Just this year they (Bollgard people) came to the village and held a meeting, didn’t they? I went to Jangaon and bought two tins and spent Rs.3200. We planted the way they told us to. What do I know? They said pests won’t come. Didn’t happen like that. Crop is full of pests. Ate into the leaves. Holes all over. They gave us a pesticide with the seed and asked us to spray it once. We did. Still pests overwhelmed it, again I bought mandu (pesticide) and sprayed. Thrice. Pests still continued to eat away. There is no boll nothing. Here and there, a plant has one or two or three or five bolls. Some plants have none whatsoever.

“By now people would have finished cotton picking like this [points to a neighbouring field where harvest is on]. Now look no boll matured, no boll opened.”

“Are you talking about Bollgard or Raasi?”

“The first one. What am I feeling? Got destroyed unjustly. Thought this will save me. But even this is gone. There is no boll, nothing.

“The plants grew well. Field all over for appearance, but no boll. I even irrigated once when sun was harsh and the field was going to dry.

“Bollgard has no bolls, only plants. Half a litre mandu for Rs.1600. Look, I sold this bangle for that Rs.1600. Gave it to that dookan (shop). He gave me a quarter litre mandu (pesticide).

Some tin. Asked me to mix in a pot and spray. I don’t know the name of the mandu. I cant read you see. Amant [Avaunt] they said. After I sprayed it pests got controlled.

“No one who planted this Bollgard, got nothing good out of it.

Last year when I planed Tulsi [a non-Bt hybrid] in two acres, I got Rs.50,000. Even last year Bollgard yielded nothing. If you look at the plant, one would feel, how well it has grown. Go close and see, there are no bolls. Go and see for yourself. If I say, you will feel I am lying.

We were told Bollgard yields very well, [intones her voice and stretches her hands] gives such big bolls. We said, we will also get great yields [and planted it].

That fellow came to our Komala meeting and said he got 16 quintals per acre, I sold 16 quintals. We believed. If you say something, we believe, what else can we do?

Now you are asking me to talk. I am talking. I don't know whether you will get me to safety or drown me. We are not literate. Fools. How can we withstand the educated?

Why must they[seed companies] earn like this: do this fraud, be unfair and rob people?

But we work hard, don't we? Leaving our children, our homes, from dawn to dusk we work here. What can we do? Nothing to eat, nothing to wear. Eat once and sleep. What is the use of telling all this?

If someone comes to us and asks us to plant it again, we will smash his face. Will he come again asking us to plant this? Look what we have got?"

As told to our camera by Mekaleswari
from Komala village
Ranganathpally Mandal

the data collected from the farmers growing Bt cotton in the same mandal and is presented in the table 9.

Contrary to the situation in irrigated areas, the yields from Bt cotton were 24% less than the non-Bt NPM cotton group. In terms of net returns, NPM cotton performed exceedingly well under rainfed conditions compared to the Bt hybrids, with an average return more than Rs 7000 higher than the return from Bt cotton per acre.

The above case presents a very strong argument for

Table 9: Comparative economics of Bt and NPM cotton under rainfed conditions

	MECH Bt	NPM Non-Bt	Additional expenditure for Bt (%)
	n=13	n=10	
Seed	1600	545	293%
intercultivation	1321	1020	29%
Fertilisers	1962	1100.5	78%
Pl protection	2160	335.5	643%
Total costs	10450	5363	94%
Yield	386	508	24% less
Gross returns	6999	9053	23% less
Net returns	-3451	3690	Rs 7141 less
B/C ratio	0.67	1.69	

Note: All expenses in Rs / acre and yield in kilos/ acre

Table - 10

Ratio of parasites & predators population in MECH Bt and Non-Bt with NPM Plot

S no	Month	Beneficial Insect count	Monthly acerage
		MECH-Bt field	Non-Bt NPM field
1	September 2004	1	2
2	October 2004	1	1.7
3	November 2004	1	2
4	December 2004	1	1.5

Beneficial insects include: Ladybird beetles, spiders

promoting NPM approaches to pest management. With more than 60% of the total cotton area under rainfed conditions, farmers should think of cost-effective and sustainable production methods (such as NPM), by effectively using the locally available resources, instead of going in for Bt hybrids with hidden risks.

Predators population:

Among the predators only the ladybird beetles and spiders besides birds and wasps were found in the cotton field. Ten plants from each one of 5 fields were examined at weekly intervals, each time at 8.00 am.

Table 10 shows the average number of predators as recorded from 1st September to end of December 2004. While the average number of above predators was 1 per plant on MECH Bt. The NPM plots had 1.5 - 2 per plant of cotton per day. Thus a ratio 1:1.5 to 2 was stable till the end of December 2004.

It is to be noted that both the fields were surrounded by cotton fields sprayed with pesticides. Even Bt fields were also sprayed with chemicals as against 'zero chemical' sprays for NPM plots. The effect of Bt toxins on the predator population needs an indepth study.

8. Biosafety Issues

In the preceding discussion, we have focused mainly on the economic aspects of Bt cotton cultivation, but there are other important issues involved, not least of which is the matter of biosafety.

Planting of refugia

Over the three years of the study, all farmers have stated that they have complied with the advice of Mahyco-Monsanto to planting border rows of non-Bt hybrids in 3 to 5 lines as refuge. This was conveyed to them through audiocassettes and product-literature supplied along with the seed packets (This audio education , however was confined only to the first year).

All other treatments like spacing, manure and fertilizers application were the same for Bt, refuge, and non-Bt cotton hybrids.

When asked about the purpose of the refuge, no clear information was available. Most of them said that it was to serve as a barrier or trap crop for the migrating moths and caterpillars or to prevent transfer of pollen to other plants and varieties, while scientific literature says that refuge is to serve as a host for the susceptible bollworms to be available for mating with surviving resistant insects to delay the resistance development.

There was no proper mechanism to monitor whether refuge was planted or not in the farmers' fields. In addition, the technicalities pertaining to planting the refuge were also not clearly mentioned in the approval given to Mahyco-Monsanto by GEAC. The study team also could not find remarkable difference between the refuge crop and the main crop in the field.

Mixing of seed cotton

In the first year of cultivation, all the farmers who had grown Bt crop witnessed a drop in the price for their produce as well as less preference by the traders. So they had resorted to mixing of the both Bt and non-Bt seed cotton to offset the drop in the price as well as to push their Bt produce under the cover of non-Bt seed cotton. Another important reason for mixing Bt and non-Bt was the shorter staple length of the Bt cotton lint. As Bt lint was attracting less price and preference from the market, they had mixed it with Non-Bt hybrids before taking their produce to the market. Farmers continue to mix Bt and Non-Bt crops even today.

GEAC was silent on these issues as there are so many fears from different groups that oil from these seeds (GM seeds) would find its presence in the food chain, which might lead to unknown diseases. There was no monitoring and regulation at any level to check the mixing of Bt crops with non-Bt crops. Cottonseed oil is normally used in cooking and preparation of vanaspati in India. This is a serious issue of food contamination. In addition, GM contamination might enter into the food chain through the use of cotton seed cake for cattle feed purpose.

9. Conclusion

Biotechnology is hailed as a great saviour of the world's poor. A handful of corporations are investing billions of dollars in developing proprietary technologies, anticipating massive returns, using intellectual property rights (IPRs) as tools to exploit farmers. Once these IPRs are in force, farmers simply become eternal-dependents on these few corporations for critical inputs, especially seeds. They will no longer be able to save their own seeds and use them in the following year. What one needs to understand about these technologies is not merely their 'scientific' aspects, but also the social consequences of these technologies.

As concerned individuals, we, civil societies have some serious concerns about the sustainability of this kind of technologies, mainly at three levels: the technological / field level, the trade/policy level and, last but not the least, at the ethical level.

Technological / Field level concerns

Traditional agricultural knowledge is not private property. All the crops, varieties and landraces are the result of millennia of hard work, continuous & careful selection, and maintenance by millions of unknown and unsung farmers all over the world. Many of the third world countries are centres of biodiversity and home to a number of species. By growing these GM crops, the native crops get contaminated through cross-pollination involving the transfer of pollen from GM crops to nNon-GM crops. The possible outcome of these transformed genes getting mixed with other species, the possible impact of these genes on beneficial insects, etc. are issues which are yet to be studied and about which little information is available. Further, these GM foods may cause bacteria to become resistant to antibiotics, and they may also produce allergens.

The quest for developing plants with greater resistance against major insect pests may prove unsustainable in the long run, with the pests adapting to the changes. As in the case of toxic pesticides, wherein pests have been successful in developing resistance to the most toxic of pesticides, they may also succeed in overcoming the toxins produced by the genetically modified genes. This situation may warrant more aggressive toxins/technologies (such as gene pyramiding) to achieve the objective. This is a dangerous treadmill, fraught with dreadful environmental consequences.

Aggressive trade strategies will wipe out biodiversity, and endotoxins will devastate natural parasites, predators and soil-borne pest pathogens. This will be a holocaust for safe agriculture.

Trade / Policy level concerns

Transnational corporations have their eyes on the huge market potential of the seed markets in the third world. Presently the seed needs of the majority of the farmers are being met by the local players or farmers themselves, either by self-saving of the seeds or through appropriate seed exchanges. The corporates see this as a big opportunity, and the technology developed by them under the regimes of IPRs and skewed WTO trade policies becomes a tool to interfere in the sovereign affairs of nations.

Once these technologies are used in all the crops, the farmer will have no security of seed and will also lose control over her/his own seed, since laws under Intellectual Property Rights regimes will restricts her/ his right to save and use seeds.

Further, we have seen situation where multinational corporations take a local crop, make some minor modifications (if at all) and then patent it. They then sell it back to the same farmers, who cannot save and use their seeds. This kind of biopiracy is becoming increasingly rampant.

The indebtedness of farmers will increase with greater dependence on external resources needed for the cultivation of the genetically modified crop. Already we are witnessing how such a dependence on external inputs is leading to alarming suicides among farmers who are trapped by debt. We are afraid that the introduction of GM crops will magnify this tragic phenomenon several times over.

Ethical concerns

Man is but a tiny part of the total ecosystem. Already with our unsustainable ways of using the natural resources, we are creating many problems for the other members in the ecosystem such as natural enemies, predators, etc. As responsible parts of the total ecosystem, we should not interfere with nature in its natural course of action. Nature has endowed the humankind with a number of sustainable ways of coping with the pests using renewable natural resources. We should try to concentrate on these technologies and make available the cheapest and most sustainable technologies to the farming community, rather simply chasing after unsustainable technologies.

Lastly....

In India, we are sitting on a huge mountain of rotting buffer stocks. At the same time, hunger deaths are also haunting us. The real solution lies not just in increasing the production but in equitable distribution. Every year farmers take to the streets requesting governments to ensure a reasonable price for their produce. If the government is really concerned about farmers, it should addresss these issues on a priority basis, and not waste its resources on the false dreams of unsustainable GM technology.

We once again emphasize that the policy of encouraging genetically modified cotton needs a complete review and critical examination from the point of view of environment, diversity and health.

Annexures

1. List of NGO collaborators and investigators 2004 - 05
2. Bt cotton seed sales in Andhra Pradesh in 2002 - 03
3. District wise distribution of Bt cotton seed sales in 2003 - 04
4. Estimated Bt seed sales in AP in 2004 - 2005

Annexures

1. List of NGO collaborators in 2004 - 05

S no	Name of the district	Name of the Organization	Head of the Organization	Names of the Research assistant
1	Adilabad	SUN (P)	Mr Shivaji	Mr. Sayanna
2	Adilabad	CSTD	Mr. Yaswanth	Dinesh
3	Nalgonda	PEACE	Mr. Nimmaiah	Mr Swamy Ms.Swaroopa
4	Warangal	CROPS	Mr Lingaiah	Mr. Bikshapati Mr. Giribabu
5	Warangal	Modern Architects for Rural India	Mr Murali	Mr. BN Chary Mr. Bhadraiah Ms Sujatha
6	Warangal	PRAGATI	Mr John	M.Ratnam K.Jairaj P.Suriah
7	Warangal	Sarvodaya Youth Organization	Mr. Damodar	Mr. Shanta Raj Mr. Tilak Mr.Kishan
8	Warangal	SEED	Mr.Damodar	Mr. Ch.Sambaiah
9	Warangal	SEVA	Mr Raja Rao	Mr.T Veera Swamy Mr. V. Venu
10	Warangal	SPACE	Mrs Shoba	Mr.G.Uday Bhaskar
11	Warangal	SSS	Mr Sudhakar Reddy	Mr. Ch.Devendar Reddy

2. Bt cotton seed sales in Andhra Pradesh in 2002-03

S no	Name of district	No of packets sold
1	Adilabad	1442
2	Medak & Ranga Reddy dists	501
3	Vizianagaram	183
4	Mahabubnagar	548
5	Prakasam	148
6	Nalgonda	708
7	Khammam	1472
8	East Godavari	98
9	Karimnagar	1136
10	Guntur	1281
11	Warangal	1576
12	Krishna	100
13	Kurnool	148
	Total	**9341**

Source: Dept of Agriculture GoAP

3. District wise distribution of Bt cottonseed sales in 2003-04

No of packets (450g of Bt seeds & 120 g of Non-Bt seeds)

S no	District	MECH-12 Bt	MECH-184 Bt	MECH-162 Bt	Total
1	Srikakulam	0	0	0	0
2	Vizianagaram	0	17	0	17
3	Visakhapatnam	0	0	0	0
4	East Godavari	160	37	0	197
5	West Godavari	0	42	0	42
6	Krishna	330	265	30	625
7	Guntur	1179	1205	26	2410
8	Prakasam	0	134	0	134
9	Nellore	0	0	0	0
10	Kurnool	229	0	0	229
11	Anantapur	0	0	0	0
12	Kadapa	0	9	0	0
13	Chittoor	0	0	0	900
14	Ranga Reddy	82	663	0	745
15	Nizamabad	0	0	0	0
16	Medak	228	350	0	578
17	Mahabubnagar	160	155	0	315
18	Nalgonda	424	549	9	982
19	Warangal	1479	900	118	2497
20	Khammam	1306	843	70	2219
21	Karimnagar	103	396	0	499
22	Adilabad	261	235	2	498
		5941	**5812**	**395**	**12148**

4. Estimated seed sales in Andhra Pradesh State in 2004 - 05

District	No of packets (450g of Bt seeds & 120 g of Non-Bt seeds) for 1 acre				Total
	Mahyco Seeds Ltd			Rasi seeds Ltd	
	Mech 12 Bt	Mech 162 Bt	Mech 184 Bt	RCH 2 Bt	
Vizianagaram	230	0	0	30	260
East Godavari	230	0	0	80	310
West Godavari	50	0	0	0	50
Krishna	2340	0	0	3310	5650
Guntur	8163	0	10	14500	22673
Prakasam	370	30	0	100	500
Kurnool	1580	240	0	350	2170
Cuddapah	0	0	0	0	0
Rangareddy	8625	25	0	2525	11175
Nizamabad	125	0	200	100	425
Medak	4770	0	0	1290	6060
Mahbubnagar	7330	0	0	8220	15550
Nalgonda	5911	0	0	70	5981
Warangal	15100	550	4300	26110	46060
Khammam	9170	170	40	8510	17890
Karimnagar	14960	0	20	6720	21700
Adilabad	14400	0	1850	9170	25420
Others	20	0	0	290	310
Total	**93374**	**1015**	**6420**	**81375**	**182184**

List of farmers participated in the study in 2004-05

District : Warangal
Mandal : Parvathagiri
Village : Wadlakonda

1. Pusukuri Suman
2. Maddeboina Mallaiah
3. Maddeboina Lingaiah
4. Maddeboina Chinna Mallaiah
5. Mandapuram Yellagoud

District : Warangal
Mandal : Parvathagiri
Village : Narayanapuram

6. Banoth Yeranna
7. Bommagani Ramesh
8. Kondikatla Yakaiah
9. Kothur Ramulu
10. Kothur Srinivas

District : Warangal
Mandal : Parvathagiri
Village : Parvathagiri

11. Chiripothula Sudhakar
12. Chintakuntla Ramesh
13. Kote Malaiah
14. Paindla Sammaiah
15. Bakki Ramulu
16. Sakinala Veeraswamy
17. Chintpatla Someswara Rao
18. Narisetti Lingaiah
19. Samudrala Sambamurthy
20. Bakki Srinivas

District : Warangal
Mandal : Parvathagiri
Village : Gorugutta Thanda

21. Banoth China Redya
22. Banoth Bhaskar
23. Banoth Kishan
24. Banoth pedda Redya
25. Banoth Bojya
26. Banoth Ei rya
27. Banoth Deva
28. Banoth Banya
29. Banoth Somla
30. Banoth Shankar

District : Nalgonda
Mandal : Yadagirigutta
Village : Choller

1. K.Yadaiah
2. K.Beeraiah
3. Jogu Ilaiah
4. K.Yadagiri
5. Kokkala Konda Balaiah
6. K.Malaiah
7. Gaddimeeda Mallesham
8. K.Ravinder
9. K.Yadaiah
10. K.Gouraiah

District : Nalgonda
Mandal : Bhongiri
Village : Chandupatla

1. Kanukala Ilaiah
2. Kanukala Sailu
3. Subburu Beerappa
4. Subburu Pandu
5. Subburu Narsaiah
6. Chinnam Balaraju
7. Jetti Ravinder Reddy

District : Nalgonda
Mandal : Bhongiri
Village : Kunooru

1. Pasula Sabestein
2. Bandanadham Arlaiah
3. Dommari Yattaiah

District : Warangal
Mandal : Raghunathapalli
Village : Veldi

1. Ragulu Ashok
2. Tolpanuri Yadagiri
3. Pendli Yellareddy
4. Nakireddy Pratap
5. Nunemunthala Yellaiah
6. Rasamalla Komaraiah
7. Koyyada Venkataiah
8. Nunemunthala Yakaswamy
9. Nunemunthala Laxmiah
10. Rasamalla Yadigiri

District : Warangal
Mandal : Raghunathapalli
Village : Nidigonda

1. Devara Sailu
2. Kota Narsaiah
3. Chebelli Komaraiah
4. Kasu Chennapareddy
5. Bandi Komaraiah
6. Malla Srisailam
7. Chebelli Srisailam
8. Devara Koramallu
9. Malla Mallesham
10. Devara Venkataiah

District : Warangal
Mandal : Atmakur
Village : Akkampet

1. Naganaboina Kumaraswamy
2. Rairakula Ilaiah
3. Yerukula Ramana

4. Induri Rajireddy
5. Mysoor Ramesh
6. Irukula Lingareddy
7. Kadudula Ravinder
8. Kadujala Sampath
9. Nagana Chinna Kumaraswamy
10. Irukula Sampath

District : Warangal
Mandal : Geesugonda
Village : Potharajupalli

1. Puskuri Yadigiri
2. Ballu Krishna
3. Ballu Sammaiah
4. Ballu Yadagiri
5. Pakidi Sambarao
6. Dommati Narasaiah
7. Bollu Salaiah
8. Dukkuri Rajaiah
9. Ballu Kumaraswamy
10. Kothapalli Sreenu

District : Warangal
Mandal : Geesugonda
Village : Bodduchintalapally

1. Kati Badrayya
2. Nerella Appaiah
3. Meredugonda Raju
4. Koti Eswaraiah
5. Kunamalla Adinarayana
6. Doddu Narasaiah
7. Gaddi Yellaiah
8. Bopparathi Komaraiah
9. Induri Sudhakar
10. Pogula Balaraju

District : Warangal
Mandal : Duggondi
Village : Togarrai

1. Challa mallareddy
2. Odeti Karunakar
3. Karutlavelli Rajendar
4. Ammireddi Ravi
5. Koluvula Sambaiah

District : Warangal
Mandal : Duggondi
Village : Togarrai

1. Sukine Pedda Rajeshwararao s/o Rajalingam
2. Bussari Rajeswara Rao
3. Mortala GopalaRao
4. Sukine Chinna Rajeshwararao
5. Burgula Rajeswararao
6. Bussari Komaraiah

District : Warangal
Mandal : Duggondi
Village : Ponakal

1. Gunde Rajendar
2. Vadakari Rajeshwara Rao
3. Bussari Tirupati Rao
4. Yerrabanti Narasinga Rao

District : Warangal
Mandal : Duggondi
Village Nachinapalli

1. Nalla Devendar
2. Kanneboina Sammaiah
3. Sri Ramoju Prabhakar
4. Puchhakayala Srinivasa Reddy
5. Ijjagiri Sambaiah

District : Adilabad
Mandal : Kubeer
Village : Parthi (K)

1. Gojala Chinna Rajanna
2. Sane Gangaram
3. Jangam Madhaiah
4. Menchu Posetty
5. Satham Shanker
6. Bandhel Shanker
7. Danagari Devanna
8. Satham Yerranna
9. Satham Nandakumar
10. Akula Venkateshwar

District : Adilabad
Mandal : Kubeer
Village : Souna

1. Pundleek Patel
2. Kemsetty Sesharao
3. Panchapadi Shankerpatel
4. Y.Maruti
5. Bojappa Maruti
6. Kemsetty Potanna
7. Chandre Vithal
8. Kemsetty Subash
9. K.Papanna
10. Daturam

District : Warangal
Mandal : Vardhannapet
Village : Singaram

1. Mulagundla Ramohan Reddy
2. Billa Komal Reddy
3. Gopu Ashok Reddy
4. Billa Devendar Reddy
5. Sagante Kumaraswamy

District : Warangal
Mandal : Hanamkonda
Village : Malkagudem

1. Kusumba Devendar
2. Gopu KomuraReddy
3. Munigala Venkatesh
4. Garika Mogali
5. Chilipuri Venkat Reddy

District : Warangal
Mandal : Parkal
Village : Narlapur

1. Peddaboina Ravinder
2. Marapelli Ramulu
3. Sanigarapu Lingaiah
4. Sanigarapu Rajaiah

5. Bairagoni Tirupati
6. Sanigarapu Saraiah
7. Chowpuri Sambaiah
8. Sanigarapu Odhelu
9. Sanigarapu Jampaiah
10. Sanigarapu Sambaiah

District : Warangal
Mandal : Mulugu
Village :Jakaram

1. KommuRaju Srinu
2. Kommuraju Mallaiah
3. Dandeboina Raju
4. Anneboina Janardhan
5. Anneboina Bhadraiah

District : Warangal
Mandal : Mulugu
Village :Sriramulapalli

1. Motapothala Anandam
2. Bammani Suguna
3. Anamgiri Kanakaiah
4. Yara Kumaraswamy
5. Rasapedda Mallaiah

District : Warangal
Mandal : Venkatapur
Village :Inchincherupally

1. Uppanuthela Sattaiah
2. Kommalla KommalaReddy
3. Samudrala Sampathi
4. Marri Papireddy
5. Guguloth Sukya Naik
6. Komandla BrahmaReddy
7. Kathula Venkateshwarlu
8. Nakka Mallaiah
9. Komalla Chandra Reddy
10. Pallam Srinivas
11. Pathipaka pedda Kumaraswamy
12. Mundadeni Sambaiah
13. Tamisetti Kumaraswamy

District : Warangal
Mandal : Nekkonda
Village :Chandragonda

1. Pathipaka China Kumaraswamy
2. Sangani Venkanna
3. Vadde Sudhakar
4. Sangani Srinivas
5. Sangani Raju
6. Vadde Veeranna
7. Dasari Ramulu

District : Warangal
Mandal : Nekkonda
Village :Redlawada

1. Chedipaka Komaraiah
2. Kasturi Narasaiah
3. Dudimetla Komaraiah
4. Karnekanti Yadagiri
5. Dudimetla Yadagiri
6. Sunkaraboina Venkaanna
7. Nalabala Dudaiah
8. Kappala BalRaj
9. Uppula Venkataiah
10. Rasuri Shanker

District : Warangal
Mandal : Nekkonda
Village :Appalaraopet

1. Vadde Venkateshwarlu
2. Vadde Venugopal
3. Gajula Ramesh
4. Tippani Prabhakar
5. Dudi Krishna Murthy
6. Vadde Veeranna
7. Kathi Saranga Pani
8. Tippani Sudhakar
9. Murahariseti Karunakar
10. Vadde Ramesh

District : Warangal
Mandal : Utnoor
Village :Salawada

1. A.Dhanlal
2. K.Aravind
3. K.Vijay Kumar
4. Mahawan lal
5. A.Subash
6. R.Chander Singh
7. J.Seeva Lal
8. A.Datha Ram
9. S.Ganga Singh
10. J.Parasram

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